(29,026)

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1922.

No. 476.

THEODORE A. HEYER, DOING BUSINESS AS T. A. HEYER DUPLICATOR COMPANY, PETITIONER,

vs.

DUPLICATOR MANUFACTURING COMPANY.

ON WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SEVENTH CIRCUIT.

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1 Pleas in the District Court of the United States for the Northern District of Illinois, Eastern Division, begun and held at the United States Court Room, in the City of Chicago, in said District and Division, before the Honorable George A. Carpenter, District Judge of the United States for the Northern District of Illinois, on Friday, the twentieth day of May, in the year of our Lord one thousand nine hundred and twenty-one, being one of the days of the regular May Term of said Court, begun Monday, the second day of May and of our Independence the 145th year.

Present:

Honorable George A. Carpenter.
John J. Bradley, U. S. Marshal.
John H. R. Jamar, Clerk.

2 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Plaintiff,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} No. 956

Be it remembered that heretofore, to-wit: on the fifth day of October, 1917, came the above named complainant, by its solicitor, and filed its bill of complaint, as follows:

3 Filed Oct. 5, 1917. Service, Oct. 9, 1917.

IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company,
Complainant,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity #956

BILL OF COMPLAINT.

To the Honorable, the Judges of the District Court of the United States in and for the Eastern Division of the Northern District of Illinois:

Duplicator Manufacturing Company, hereinafter termed Complainant, a corporation organized and existing under and by virtue of the laws of the State of West Virginia, and a

citizen and inhabitant of said State and having an office and place of business in the City of Chicago, County of Cook and State of Illinois, brings this its Bill of Complaint against Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, a citizen and inhabitant of said State, and having his principal office and place of business in the City of Chicago, County of Cook and State of Illinois, in said Northern District of Illinois, where the acts of infringement herein complained of were committed, and says:

1. That this suit is for infringement of United States Letters Patent No. 965,887, Multiple Copying Machine, issued to John J. Flanigan of Chicago, Illinois, Aug. 2, 1910, on
4 the application of said John J. Flanigan, and is founded upon the United States Statutes relating to letters Patent.

2. That John J. Flanigan, being the original and first inventor of new and useful improvements in Multiple Copying Machines, and being, by reason of his conformity and that of said invention with every provision of law relating thereto, entitled to Letters Patent of the United States, made proper application therefor, with the result that Letters Patent of the United States No. 965,887 were issued in due form for said invention on Aug. 2, 1910, to said John J. Flanigan, whereby there was granted to him, his heirs and assigns, the exclusive right to make, use and vend the invention set forth, and described and claimed therein for the term of seventeen (17) years from the said second day of August, 1910, throughout the United States and the territories thereof.

3. That the said John J. Flanigan did, by an instrument in writing executed on the 17th day of December, 1910, and recorded December 23, 1910, in Liber Y_1 85, page 269 of Transfers of Patents, and for a valuable consideration, sell, assign and transfer the entire right, title and interest in and to said Letters Patent, for the entire remaining term thereof to this Complainant. A printed copy of the specification and drawings of said patent is hereunto annexed and made a part of this Bill; and profert and hereby made of said instrument of assignment hereinabove referred to, or of a duly certified copy thereof, to be produced in court when necessary.

4. That the invention of said letters patent is of great value and utility; that for many years Complainant has
5 enjoyed a large and profitable business in the manufacture and sale of Multiple Copying Machines embodying and containing the invention of said Letters Patent, that, with the exception of the unlawful acts of this defendant, the public

has generally acknowledged and respected the validity of said Letters Patent and acceded to the rights of Complainant in the same, and Complainant believes it will receive and realize substantial gains and profits from such invention if infringement of said Letters Patent by this Defendant and his unlawful acts complained of herein shall be prevented.

5. That Complainant has given due notice to the public that its said Multiple Copying Machine was patented by affixing thereto the word "Patented" together with the date of its said Letters Patent, and that Complainant has complied in all respects with the statutes in such case made and provided, and that Defendant has also been notified in writing of the said Letters Patent and his infringement thereof and has refused to cease this infringement.

6. That the duplicating band and the spools upon which said duplicating band is wound constitute important and essential parts or elements of the Multiple Copying Machine of said Letters Patent and of the combinations of parts or elements defined in the claims of said Letters Patent, and that the said spools in particular are of peculiar and novel construction specially designed and fitted to cooperate and coordinate with other parts and elements of said machine, and that Complainant's said patented machine is the only machine now on the market in this country with which said spools are capable of being used.

6 7. That the Defendant, well knowing the premises and the rights accrued to Complainant as aforesaid, and contriving to injure Complainant and deprive it of the advantages which might and otherwise would accrue unto it from said invention and said Letters Patent No. 965,887, after the 17th day of December 1910, and after the Complainant secured the entire right, title and interest in and to said invention and letters patent and before the commencement of this suit and within six years last past did, without the license and allowance and against the will of Complainant and in violation of Complainant's rights and in infringement of the aforesaid Letters Patent, unlawful and wrongfully and in defiance of the rights of Complainant at Chicago, Illinois, and elsewhere within the Northern District of Illinois, manufacture and sell to Complainant's customers, and is still manufacturing and selling to Complainant's customers, duplicating bands and spools embodying and containing the invention set forth and claimed in the aforesaid Letters Patent with the full knowledge and intent that said duplicating bands and spools shall be used in Multiple Copying Machines made and sold by

Complainant under the aforesaid Letters Patent, and the duplicating bands and spools so manufactured and sold by Defendant have been assembled with and used as parts of multiple copying machines embodying the invention of said Letters Patent No. 965,887, all in derogation and defiance of Complainant's rights aforesaid and to its great injury and loss.

8. That Complainant has already suffered and sustained great loss and damage by reason of the infringement aforesaid, but as to the exact amount or extent complainant is unaware; that the Defendant has realized large gains and profits from and by reason of his said infringement, but the exact amount or extent thereof is likewise unknown to Complainant, and that the said damages and profits may fully be ascertained by an accounting in the manner and form provided for in equity procedure, and that Complainant has no adequate relief save in a Court of Equity, where matters of this kind are properly cognizable and relievable.

Wherefore, this Complainant, having no full and complete remedy of law, prays:

1. That the said Defendant may be compelled by a decree of your Honorable Court to account for and pay over to this Complainant all such gains and profits as have accrued or arisen to or been earned or received by the said Defendant and all damages Complainant has sustained thereby, and that this Honorable Court will assess the same or cause them to be assessed under its direction and will increase the actual damages so assessed to a sum three times the amount of such assessment under the circumstances of the unlawful and unjust infringement by said defendant as herein set forth.

2. That the Defendant, his agents, workmen, employes, heirs, assigns, successors in business, and all other representatives may be perpetually enjoined and restrained by a decree of this court from directly or indirectly making or offering to make or causing to be made, using, or causing to be used, or vending to others to be used in violation of the rights of this Complainant, as aforesaid, any Multiple Copying Machines or parts thereof containing, embodying or employing said invention, improvement or discovery described and claimed in Complainant's said Letters Patent, or from infringing upon or violating said Letters Patent in any way whatsoever, or Complainant's rights in the premises.

3. That the said Defendant may be required to appear

and make full and direct answer to the matters hereinbefore stated and charged (but not under oath, answer under oath being expressly waived) according to the best of his knowledge, experience, information and belief, to the several matters hereinbefore averred and set forth, as fully and particularly as if the same were repeated paragraph by paragraph and the said Defendant specifically interrogated concerning the same.

And Complainant will ever pray, etc.

DUPLICATOR MFG. CO.
By JAMES A. JOY,
President.

POND & WILSON
WILKINSON & HUXLEY
Solicitors for Complainant.
SAMUEL N. POND
IRA WILSON
GEORGE L. WILKINSON
HENRY M. HUXLEY
Of Counsel.

9 State of Illinois, } ss.
County of Cook. }

JAMES A. JOY, being duly sworn, deposes and says that he is President of the Duplicator Manufacturing Company, Complainant in the above entitled suit; that he has read the foregoing Bill of Complaint subscribed by him as President of the Company, and known the contents thereof, and that the same is true to the best of his knowledge and belief, except as to those matters stated on belief, and as to those things he believes them to be true.

JAMES A. JOY.

Subscribed and sworn to before me this 24th day of September, 1917.

RICHARD M. LENIHAN
(Seal) *Notary Public.*

Here follows "Copy of Patent in Suit," but not copied.

(Endorsed) Filed Oct. 5, 1917 T. C. MacMillan, Clerk.

10 And on to-wit: the 28th day of November, 1917, there was filed in the Clerk's office of said court a certain Answer in words and figures following to-wit:

11 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company, *Plaintiff*,
—*vs*—
Theodore A. Heyer, doing business as T. A. Heyer Duplicator Company, *Defendant*.

In Equity. No. 956.

ANSWER.

This defendant, without waiver of advantage of exception to the Bill of Complaint, for answer thereunto says:

1. That as to whether the plaintiff is a corporation of West Virginia, having an office and place of business in Chicago, Illinois, this defendant has no knowledge, and therefore leaves the plaintiff to its proofs in that regard; but this defendant admits that he is a citizen and an inhabitant of the State of Illinois, in the Northern District thereof, and that he has his principal office and place of business in the City of Chicago, and that such business is conducted under the name and style of T. A. Heyer Duplicator Company.

2. This defendant denies that John J. Flanigan was 12 the original and first inventor of certain new and useful improvements in Multiple Copying Machines, and denies that he made proper application for letters patent of the United States, but admits that certain Letters Patent No. 965,887 were issued to the said Flanigan, purporting to grant to him certain rights in respect to said pretended invention.

3. That as to whether the said Flanigan, by an instrument in writing, assigned the title to said alleged invention and said letters patent to the plaintiff, this defendant has

no knowledge, and, therefore, leaves the plaintiff to its proofs in that regard.

4. This defendant further answering denies that said pretended invention is of great value and utility; denies that the plaintiff has developed a large and profitable business in the manufacture of machines embodying said pretended invention; denies that the public has acquiesced in the validity of said letters patent, and denies that the defendant has, by infringement or otherwise, prevented the plaintiff from receiving any gains or profits to which it was lawfully entitled.

5. This defendant further answering denies that the said copying machines were duly marked "Patented," as provided for in the statute, and denies that he was notified in writing of any alleged infringement of said patent.

6. This defendant further answering denies that the duplicating bands and spools constitute important and essential parts or elements of said copying machines, or that the same are properly to be considered as legitimate parts or ele-
13 ments of the claims of said patent, and denies that said spools are especially designed and fitted to co-operate and co-ordinate with other parts and elements of said machines, or that the plaintiff's machine is the only machine on the market in which said spools are capable of being used; but, on the contrary, alleges that said spools and bands are of the common and usual type employed for similar or analogous purposes, that the same are proper and legitimate articles in general trade and that the public generally, including this defendant, is lawfully entitled to use and trade in the same without let or hindrance from the plaintiff.

7. This defendant denies that he has conspired or contrived to injure the plaintiff by infringing said patent, or otherwise; denies that he is manufacturing and selling to the plaintiff's customers duplicating bands and spools embodying and containing the invention set forth; denies that said spools and bands are intended for use on machines embodying or containing the inventions defined in the letters patent aforesaid, or that said spools and bands are capable of so combining; but this defendant alleges the fact to be that certain spools and bands which he has heretofore sold for use on duplicating machines are of a character which this defendant had a right to sell to users of duplicating machines generally, including users of plaintiff's duplicating machines, and further alleges the fact to be that said bands and spools are of a transient and temporary character, which are in-

tended to be used and destroyed in the regular and ordinary operation of duplicating machines, and are of a character
14 which the users of such machines have a right to renew or have renewed for themselves without any obligation to secure such renewals from the plaintiff, and without thereby infringing upon any rights of the plaintiff acquired by reason of the Patent Laws of the United States. And this defendant further charges the fact to be that the plaintiff, in seeking to enjoin and restrain the defendant in the furnishing of such renewal parts, is endeavoring to expand and enlarge the scope of its alleged patent protection in a manner contrary to the laws and statutes in such case made and provided, and in a manner contrary to the interests of public policy, in that the said plaintiff is thereby endeavoring to monopolize and control the furnishing of supplies intended for use on duplicating machines manufactured by it, which supplies are not in themselves proper and legitimate subjects for patent protection, and which, on the contrary, properly comprise articles in general and unrestricted use in trade and in which the plaintiff has no lawful monopoly.

And this defendant further alleges the fact to be that the business which is here complained of has consisted merely in renewing the transient and ephemeral duplicating bands which have been attached to the spools manufactured by the plaintiff and originally furnished to the users of plaintiff's machines as a part of the original equipment for such machines; all of which matters and things this defendant had a right to do without let or hindrance from the plaintiff.

15 8. This defendant further answering denies that the said J. J. Flanigan was the original and first inventor or discoverer of the alleged inventions and improvements described and claimed in Letters Patent No. 965,887; but, on the contrary, avers and insists that such inventions and improvements were in public use long prior to the date of such alleged invention, and that the same were in public use or on sale in the United States for more than two years prior to the date of the application for said Letters Patent; that the same were not the proper subjects for patent protection; that they constitute mere aggregations and not patentable combinations; that the machine shown and described in said patent is inoperative, impractical, and unfitted for commercial usage; and that the said alleged inventions and improvements were described and claimed in various prior Letters Patent, as follows:

No. 237,158,	February 1, 1881,	Bendall,
355,084,	December 28, 1886,	Houston,
373,800,	November 22, 1887,	Dooley,
385,026,	June 26, 1888,	Waldron,
393,956,	December 4, 1888,	Zerr,
485,275,	November 1, 1892,	Hanson,
646,112,	March 27, 1900,	Taylor
686,664,	November 12, 1901,	Mansfield,
698,157,	April 22, 1902,	Thornton,
758,322,	April 26, 1904,	Krause.

9. This defendant further answering denies that the plaintiff has suffered great loss and damage, and that the defendant has realized any gains and profits due to any acts of infringement by the defendant; wherefore, this defendant denies that the plaintiff is entitled to any account of damages or of gains and profits as prayed for, and denies that
16 the plaintiff is entitled to an injunction, as prayed, or to any other relief in the premises, and denies the equity of plaintiff's Bill, and prays that the same be hence dismissed with costs against the plaintiff.

And this defendant will ever pray, etc.

THEODORE A. HEYER
Doing business as T. A. Heyer Duplicator Co.

BANNING & BANNING
Solicitors for Defendant.
THOMAS A. BANNING
Of Counsel.

(Endorsed) Filed Nov 28, 1917 T. C. MacMillan, Clerk.

17 (Endorsed) District Court of the United States Northern District of Illinois—Eastern Division. In Equity. No. 956. Duplicator Manufacturing Co. Plaintiff, —vs— Theodore A. Heyer, doing business as T. A. Heyer Duplicator Company, Defendant. Answer. Banning & Banning, Marquette Building, Chicago, Illinois, Solicitors for Defendant.

18 And on to-wit: the 29th day of October, 1920, there was filed in the Clerk's office of said court a certain Petition and Affidavits in words and figures following to-wit:

19 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company,
Complainant,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity, No. 956

NOTICE.

Messrs. Banning & Banning,

Gentlemen:

Please be advised that on Friday morning October 29th, at the opening of Court, we shall present before His Honor, Judge Carpenter, the attached verified petition to reinstate the above case on the Equity Docket.

SAMUEL N. POND,
Solicitor for Plaintiff.

Service acknowledged this 28th day of October, 1920.

BANNING & BANNING,
Solicitor for Defendant.

20 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company,
Complainant,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity No. 956.

MOTION TO REINSTATE.

This case having, on October 4, 1920, been dismissed by the Court for want of prosecution, with permission to petition for reinstatement, supported by a showing of cause, the plaintiff hereby prays the Court that this case may be reinstated as a live case on the docket of the Court, and for reasons why the case should be so reinstated, respectfully refers to the attached affidavits.

DUPLICATOR MANUFACTURING COMPANY,
Complainant,
By J. A. JOY,
President.

21 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company, *Complainant,*

vs.

Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, *Defendant.*

In Equity No. 956.

AFFIDAVIT.

State of Illinois } ss
County of Cook }

J. A. JOY, being duly sworn, deposes and says that he is the President of Duplicator Manufacturing Company, plaintiff in the above-entitled cause; that he authorized and directed the bringing of the said suit for the purpose of arresting if possible, certain acts of the defendant which were believed by plaintiff to violate certain rights secured to plaintiff by and under certain Letters Patent of the United States duly issued to and owned by the plaintiff; that deponent and the other officers of the plaintiff corporation have all along supposed and believed that this cause was pending on a trial calendar of the Court and awaiting its turn to be reached for trial; and for the foregoing reason deponent did not press the plaintiff's attorneys to bring this cause
22 on to trial, fully supposing and believing that it would automatically come up for trial when reached in its turn.

Deponent further states that the case is a live one and has always been so regarded; that the acts of infringement alleged in the Bill of Complaint have been continued by the defendant during the pendency of the cause; that plaintiff is ready for trial, and that it is plaintiff's desire and intention to bring this cause to trial at the earliest date at which the Court can hear the same.

J. A. JOY,
President.

Subscribed and sworn to before me this 8 day of October, 1920.

THOMAS F. HANTON,
Notary Public.

(Seal)

23 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Complainant,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity No. 956.

AFFIDAVIT

State of Illinois } ss.
County of Cook }

SAMUEL N. POND, being duly sworn, deposes and says that he is Solicitor and of Counsel for Duplicator Manufacturing Company, plaintiff in the above-entitled cause; that shortly after the Bill of Complaint was filed deponent in some way not definitely ascertainable at the present time received the distinct impression, and was led to believe, that the infringing acts of the Deponent complained of in said Bill had ceased, and that it was not Plaintiff's intention to further prosecute the said suit until or unless the said
24 infringing acts should be renewed, and that in consequence of such belief or impression, Deponent took no further steps in the prosecution of the suit.

Deponent further states that this impression and belief was confirmed by the fact that at notime subsequent to the filing of the Bill did the Plaintiff request action in the case by Deponent or even make inquiry concerning the progress or status of the case.

Deponent further states that this impression and belief was confirmed by the fact that at no time subsequent to the filing of the Bill did the Plaintiff request action in the case by Deponent or even make inquiry concerning the progress or status of the case.

SAMUEL N. POND.

Subscribed and sworn to before me this 19th day of October, 1920.

LENORA SIMONS
Notary Public.

(Seal)

(Endorsed) Filed Oct 29, 1920 John H. R. Jamar, Clerk.

And on the 29th day of October, 1920, the following order was entered by the Court:

IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Friday, October 29, 1920.

Present: George A. Carpenter, District Judge.

Duplicator Manufacturing Company,
Complainant,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity No. 956.

ORDER.

This case coming on to be heard upon a verified petition by the Complainant to reinstate the case on The Equity docket of the Court, and counsel for the parties having agreed that the case may be reinstated on the condition that the Complainant be limited for the recovery of profits and damages, or either, to a period beginning October 29, 1920, it is so ordered.

Judge.

Accepted:
SAMUEL N. POND,
Solicitor for Complainant.
BANNING & BANNING,
Solicitors for Defendant.

25. 27 And on to-wit: the 25th day of April, 1921, there was filed in the Clerk's office of said Court a certain Record of Evidence in words and figures following to-wit:

29 UNITED STATES DISTRICT COURT

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Plaintiff,

vs.

Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.

In Equity No. 956.

RECORD.

(Endorsed) Filed Apr. 25, 1921 John H. R. Jamar, Clerk.

31 UNITED STATES DISTRICT COURT

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Plaintiff,

vs.

Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.

In Equity No. 956.

Be It Remembered, That heretofore, to-wit, on April 15, A. D. 1921, the above entitled cause came on for hearing before Honorable George A. Carpenter, presiding as Chancellor in said Court.

Appearances:

Messrs. George L. Wilkinson and Samuel N. Pond, appeared as solicitors in behalf of the Plaintiff;

Mr. Samuel W. Banning appeared as solicitor in behalf of the Defendant.

32 And thereupon the plaintiff, to maintain the issues on its part, introduced the following evidence, to-wit:

Mr. Wilkinson: On behalf of the plaintiff I desire to offer in evdence as Plaintiff's Exhibit No. 1 a copy of the patent in suit No. 965,887, granted August 2, 1910, to J. J. Flanigan, for Multiple Copying Machines.

As Plaintiff's Exhibit No. 2 I desire to offer in evidence the assignment of the title of the patent in suit and all rights thereunder from Mr. Flanigan, the patentee, to the plaintiff corporation.

I have some copies of that assignment and I will ask, if Mr. Banning will be so good as to allow us, to substitute a copy for the original.

Mr. Banning: Oh, yes.

The Court: That may be done.

Mr. Wilkinson: As Plaintiff's Exhibit No. 3 I desire to offer in evidence one of the plaintiff's machines which are known as the Commercial Duplicator.

As Plaintiff's Exhibit No. 4 a stipulation which has been entered into between the parties, which will simplify very much the taking of proofs.

This stipulation is:

4. 33 "1. That the usual Patent Office printed copies of patents may be offered and received in evidence on behalf of both parties, with the same force and effect as original copies or duly certified copies of such patents, subject to correction should errors appear.

"2. That within six (6) years prior to the filing of the Bill of Complaint in this cause, the defendant manufactured and sold in the Northern District of Illinois, Eastern Division, rolls, each comprising a duplicating band secured at its ends to and wound upon spools, each spool having at each end thereof a squared chuck-engaging member, and a cylindrical bearing member; that the spools of some of the rolls so sold by defendant were made by or for defendant, and duplicating bands secured to such spools by or for defendant, while the spools of other of the rolls so sold by defendant had been made by or for plaintiff, and were purchased by defendant from parties who had bought from plaintiff rolls comprising such spools and duplicating bands thereon; and that defendant manufactured and sold said rolls with the knowledge and intent that they were to be used in so-called 'Commercial Duplicators' manufactured and sold by plaintiff.

"3. That the defendant printed and circulated post cards like that hereto attached and marked 'Plaintiff's Exhibit 5.'

"4. That the defendant printed and distributed circulars like that hereto attached and marked 'Plaintiff's Exhibit 6.'

"5. That defendant distributed circular letters like those dated '4-13-16; 9-22-16; and Aug. 15th, 1919'; attached hereto and designated 'Plaintiff's Exhibits 7, 8 and 9,' respectively."

And as Plaintiff's Exhibit 5 the defendant's card referred to in the stipulation, which was sent out by the defendant.

34 "Regarding Commercial Duplicator Films

5. We Are Buying Old Films

used on your Commercial Duplicator, accompanied by two spindles at

Fifteen (15c) Cents Each

and will pay transportation charges on as many as you

wish to sell. Take advantage of this offer; thereby reducing your duplicating expense considerable.

T. A. Heyer Duplicator Co.
160 North Fifth Avenue, Chicago, Ill."

And as Plaintiff's Exhibit No. 6 a circular issued by the defendant illustrating the rolls complained of and comprising the spindles with the chuck-engaging and smooth bearing engaging portions and price lists of such rolls.

As Plaintiff's Exhibit 7 a letter sent by the defendant to a user of plaintiff's duplicating machine, giving a schedule of prices for rolls; and as Plaintiff's Exhibit No. 8 a somewhat similar letter of a later date, written to one of plaintiff's customers who uses a number of plaintiff's machines, which sets forth the prices and various sizes of rolls, and says, "In ordering please mention size wanted, also size of spindle used to attach." That is, they want to know the size of band as well as of spindle, so that they sell whatever band
35 is desired to be used on the machine; and as Plaintiff's Exhibit No. 9 another letter sent out by defendant to a customer of plaintiff's, dated August 15, 1919.

As Plaintiff's Exhibit No. 10 I desire to offer in evidence the instruction book issued by the plaintiff in connection with those duplicator machines and which will be identified as issued by the plaintiff by a witness.

Mr. Abbott, will you take the stand, please?

The Court: I think we will suspend now until two o'clock.

Whereupon a recess was taken to 2 o'clock p. m. of the same day.

36 Friday, April 15, 1921.

2 o'clock p. m.

Court convened pursuant to recess.

Present: As before.

GUY H. ABBOTT, called as a witness on behalf of plaintiff, being first duly sworn, testified as follows:

Direct Examination by Mr. Wilkinson.

Q. Will you please state your name?
A. Guy H. Abbott.

Q. Residence.
A. 5517 Hyde Park Boulevard.
Q. Occupation?
A. Vice-president of the Duplicator Manufacturing Company.
Q. How long have you been connected with the Duplicator Manufacturing Company?
A. About eleven years.
Q. Are you familiar with the business which is being transacted by the plaintiff, the Duplicator Manufacturing Company?
A. Yes, I am.
37 Q. What is the business in which the said company is engaged?
A. In the sale of the Commercial Duplicator and the necessary supplies, such as rolls, ribbons, carbon paper and duplicating paper.
Q. While I think of it, in what state is the plaintiff, the Duplicator Manufacturing Company, incorporated?
A. West Virginia.
Mr. Wilkinson: I can produce the charter of the corporation, Mr. Banning.
Mr. Banning: That is all right.
The Court: It is probably admitted in the answer, isn't it?
Mr. Banning: I believe so.
Mr. Wilkinson: No, it is not admitted.
Mr. Banning: We filed the answer about three years ago, and I have forgotten whether it was or was not.
Mr. Wilkinson: Q. Will you please briefly explain the operation of plaintiff's duplicating machine by means of the exhibit which has been offered as Plaintiff's Exhibit 3?
(The witness left the stand and went to the exhibit.)
A. I take it that you want a description of simply
38 the mechanical method of operating, not the details.
Q. Yes. Will you just explain as you go along?
A. That is what we call the master sheet. That is fed in through the carriage in this manner. As that comes in contact with the band the ink is transferred from that master sheet and makes an impression on the band. Then we feed in the blank sheets of paper in exactly the same way, let that remain in contact with the composition, and it produces copies like this (operating the machine).
Q. How many copies can be produced from a single roll?

A. As high as one hundred. That is our claim, although under certain conditions customers make a great many more copies.

Q. That is a hundred from each?

A. From one impression, yes.

Q. Each master copy?

A. Yes.

Q. And when it is desired to apply another master copy to the same band what is done?

A. This release lever here—that lever is released and this handle turns, and you wind up anew.

Q. A new master copy is then applied and the same operation is followed?

A. Exactly.

39 Q. How long is the band on each roll?

A. Fourteen and a half feet.

The Court: It can be anything you want it, I presume.

A. I beg your pardon?

The Court: Q. It can be anything you care to make it, any length?

A. We make it always that length, fourteen and a half.

Mr. Wilkinson: Q. But so far as the operation of the machine is concerned it could be any length?

A. Yes.

Q. And with a band of fourteen feet such as you furnish how many master copies can be applied to that band?

The Court: Fourteen hundred.

A. That would depend upon the size of the sheet.

Mr. Wilkinson: Master copies.

The Court: Master copies? Oh, I was counting the impressions.

A. If the master sheet were that length you could get twice as many on as if it were the full length. It depends upon the size of the master sheet.

Mr. Wilkinson: Q. Is there any particular average that you figure on as to the size of a matter copy?

40 A. No. No, that would depend upon the particular application which the customer might have. I presume there are more applications which require an eight and a half by eleven sheet than perhaps any other size, although in a great many they might be just a three by five card.

Q. So the master copies might run up to fourteen and

more that could be applied to each roll in passing through the machine once?

A. Yes.

Q. After the band has been wound from one roll to the other in manifolding from the master copies can that same band be used again?

A. Yes, it can be used over and over again; after an interval it can, of from eighteen to twenty-four hours, and used until this composition which is mounted on the backing is entirely worn out.

Q. And that number of times would vary according to the number of copies?

A. Which we take off from each impression.

Q. So that on the same surface, same portion of the surface of the band, a number of different master copies may be serially applied from time to time?

A. Yes.

41 The Court: Q. Now let me ask, after you take off your hundred impressions and then roll your curtain and make another master copy, does the original impression afterwards rejuvenate itself so it can be used again?

A. It disappears, going through the top of the roll, that is the composition part, into the backing, and that is absorbed, so that you can go over that very same spot a number of times.

Mr. Wilkinson: Q. Is there any limit to the number of master copies that can be applied to each portion of the surface of the band? If so, what is that?

A. Yes, there is a limit. That will vary according to the quantity of copies which you take off from each spot. For instance, if you took off a hundred off of each spot every time you ran it then you could only use that space over say perhaps thirty to fifty times; whereas if you took ten or fifteen copies you might use that same spot one hundred to two hundred times.

Q. Considering the repeated application of master copies to each portion of the band and the fact that the band is fourteen feet long and may receive a number of master copies, how many total copies can be made from a band before it is useless?

A. Well, in ordinary work from ten to fifteen thou-
42 sand copies. Sometimes greatly beyond that.

Q. Now, will you please show how the positions of the

spools are changed on the machine when the band had been unwound from one on to the other?

A. (The witness operates the machine.)

Q. What is there about the structure of the spools which permits the positions of the spools on each roll to be so reversed as to permit the roll to be wound in opposite directions?

A. The construction of the spindle?

Q. Yes.

A. Well, the fact that they have this what you describe as a chuck. I am not very much of a mechanical man myself. But you have a chuck and a holding device. Mr. Flanigan might explain that at particular point perhaps better than I can.

The Court: I do not think we need an expert to explain that.

Mr. Wilkinson: I think not, no. I think it is very plain.

Q. On one side, as I understand, Mr. Abbott, there are chucks, on one side of the frame, so that the chuck portion at one end of the spindle engages the chuck on that side
43 of the frame, whereas the other end of the spindle has merely a round bearing which engages a round bearing on the other side of the frame?

A. That is correct.

Mr. Wilkinson: Somewhat leading, I understand.

Mr. Banning: No objection.

Mr. Wilkinson: Q. What, if any, advantage is there in being able to reverse the position on the spindles of a roll as you have described?

A. There are two advantages, of course, one advantage is in the matter of speed. If it were necessary to wind your roll entirely back after you have finished it, it means considerable loss of time.

The other advantage—that perhaps can be shown better with one of the other rolls than this roller. Perhaps I can explain it just as well. We will assume this is a wide roller on here instead of this narrow roll. The instructions read to feed the sheets of paper right up against this guide, so that they will run from the left side over to this side. If you are using a wide roll and you do not use the entire width, that portion of the roll of course as it is run down this way is not being used at all, whereas this other side is being worn; but as

the roller is reversed then this side also gets the wear, so
44 that we are able to use economically the whole surface of the roll.

Q. Are different widths of bands ever used on the same machine?

A. Yes.

Q. Have you here at hand different widths of bands which can be used on this machine, Exhibit 3?

A. Yes, I have.

Q. Will you please refer to them? How many different widths have you here?

A. I have four different widths.

Q. And as I understand you a roller is picked out with the width of band appropriate to the width of the master copy?

A. Correct.

Q. Now, what is the advantage in having for the same machine different widths of bands rather than to have one uniform width of band?

A. Well, it is a matter of economy. For instance, with this machine the full width of band is fourteen inches, whereas perhaps fifty or seventy-five per cent. of the work which would be done would be accommodated by a band of this size (indicating), and there is a great deal of saving of money to use the smaller band for the smaller work.

45 Q. Is there any advantage gained in efficiency of reproducing copies by using different sizes of bands for different widths of master copy?

A. You mean as far as the copy is concerned?

Q. Yes, or in the wear on the band.

A. Yes. Of course, if you use a wide band for narrow work, as I explained before, you would be using— Perhaps I better explain it in a different way. The natural tendency for operating is to operate down the center of the roll, and if they were using a large roll the center would be worn down, whereas the two sides would not be worn to such an extent. Consequently, you would get to the point where this center is worn down so much that the two sides would hold up the rollers at the edges and therefore you would not get the proper amount of impression from this roller to roll your sheet down in contact. So it is always advisable to use a roll of the proper width.

Q. Does the plaintiff supply to users of its duplicating machine rolls having different widths for each duplicating machine?

A. Yes, it does.

Q. You have spoken of the necessity of allowing a band after it has been used through the machine once
46 to remain inactive for a while before being used again. In order that the machine may be continued in use how many rolls should be provided for each machine?

A. It should have as many as is necessary for the entire day's work.

Q. And that would depend upon how constantly the machine is used?

A. Yes.

Q. To your own knowledge, how many rolls have been used on the same machine in succession?

A. Well, I know of many cases where twenty-five rolls are used on one machine during the day.

Q. Are there any other duplicating machines on the market, to your knowledge, in which spindles like those used on plaintiff's duplicating machine could be used?

A. There are none; not to my knowledge.

Q. By what name has the plaintiff's duplicating machine been known to the trade?

A. It has been known as the Commercial Duplicator.

Q. Are the plaintiff's machines marked with the date of the Flanigan patent?

A. Yes.

Q. Can you point out the place?

The Court: Oh, well, if it is there it is there.

47 Mr. Wilkinson: I just wanted to be sure it was there.

Q. Are the spindles also marked with the date of the patent in suit?

A. Yes, they are.

Q. Approximately how many duplicating machines has the plaintiff sold?

A. Well, I should say about twelve thousand.

Q. Does it make any other style of machines in which the same spindles could not be used?

A. No, it does not.

Q. Does the plaintiff render any particular service to the users of its duplicating machines?

A. Yes, it renders a great deal of service. It is necessary for us to have a service department, whose entire duty is to repair machines and to give instructions to operators, explaining troubles that they may have, showing them the proper use of materials provided.

Q. I call your attention to a pamphlet and ask if you can identify it.

A. Yes, that is one of our instruction books.

Q. Does the plaintiff company apply new bands to spindles which have been previously used with other bands?

48 A. Oh, yes. Spindles may be used over many times.

Q. In what way does the plaintiff obtain the spindles on formerly used bands in order that they may be applied to new bands to make up new rolls?

A. They are returned to us by our customers.

Q. Is it the policy of the plaintiff company to make its profit in doing business on the sale of the machines themselves or on the sales of the rolls?

A. On the sales of the rolls.

Mr. Wilkinson: That is all.

Cross-Examination by Mr. Banning.

Q. Mr. Abbott, what do these machines sell for?

A. This machine sells for $160.

The Court: Q. How much?

A. $160.

Mr. Banning: Q. And do you give with the machine any form of a guaranty with regard to service, and so on?

A. We have no written guaranty, no.

Q. For how long a period of time is a machine of that character adapted to serve?

A. Well, that is rather difficult to say. There is

49 nothing about them that should wear out particularly. They ought to be serviceable, except for a matter of a few little repairs, for almost a lifetime.

The Court: That is, as I understand it, the machine and all its parts are sold outright to the customer?

A. Yes.

The Court: Q. It is not rented, like shoe machines, or anything of that kind?

A. No, sir.

Mr. Banning: I think that is all.

Redirect Examination by Mr. Wilkinson.

Q. In order that the users of the machine may conveniently keep their rolls for use does the plaintiff furnish them with any racks or supports?

A. Yes, we furnish racks somewhat similar to the one here.

The Court: That is like the little book case that comes with the encyclopedia.

Mr. Wilkinson: I do not think it will be necessary to offer that in evidence.

The Court: No, I do not think so.

Mr. Wilkinson: That is all.

50 HAROLD WRIGHT, called as a witness on behalf of the plaintiff, being first duly sworn, testified as follows:

Direct Examination by Mr. Wilkinson.

Q. Please state your name.

A. Harold Wright.

Q. Your residence?

A. 4617 North Albany Avenue, Chicago, Illinois.

Q. And your occupation?

A. Chief clerk of the contract department of the Commonwealth Edison Company, in charge of the application bureau.

Q. In your department are there any duplicating machines used?

A. Yes. There are two.

Q. What make of duplicating machines are they?

A. The Commercial Duplicator or the Ditto Machine.

Q. Do you know what concern makes and sells them?

A. The Ditto Machine Company. The Commercial Duplicator Company.

The Court: That is the plaintiff in this case?

Mr. Wilkinson: It is technically known as the

51 Duplicator Manufacturing Company.

Q. How long have the two machines that you refer to been operated under your observation?

A. I imagine we have had those machines approximately four or five years.

Q. Are the two machines the same size?

A. One machine is a larger size than the other.

Q. Referring to the larger size of machine, do you ever use different widths of bands, duplicating bands, on that machine?

A. Yes, sir, we do, when occasion demands.

Q. I might ask you whether or not the duplicating machines which you have referred to are similar to or different from Plaintiff's Exhibit 3 on the table there.

A. The large machine is similar to that machine.

Q. And does the smaller one differ otherwise than being a smaller one?

A. Just in the fact that it is smaller.

The Court: Q. Differs only in size?

A. That is all.

The Court: Q. Mechanically the same?

A. Yes.

Mr. Wilkinson: Q. Is there any advantage in using on your larger machine different widths of bands rather
52 than the same width of band all the time?

A. Yes, there is an economy there which we like to get.

Q. In the use of your larger duplicating machine, when the band has been wound up, unwound from one spindle and wound up on the other, is that band used again?

A. Yes, it is placed in the rack and used the next day by just reversing it, putting the end which was wound upon the opposite end in the morning, so that we can rewind it on the vacant spindle in the morning.

Q. Do you in the use of that big machine have to rewind the band on which it has been delivered back on to the first band?

A. We do not.

Q. Just reverse the position?

A. Just reverse the position of the roll.

Q. In order that that larger machine may be continuously used is it necessary to have more than one roller to apply to it?

A. Yes, we have enough rollers to take care of the business of the day.

Q. These rolls are continued in use along the same period of time, are they?

53 A. Yes, they are used every day.

The Court: Q. You do not make out your bills on those machines, do you?

A. No, sir, we do not.

The Court: They come so often I didn't know but you used a duplicating machine.

Mr. Wilkinson: Q. In the use of your duplicating ma-

chine approximately how many copies can be made from each band before it is worn out?

A. We figure about twelve or thirteen thousand.

Q. In the use of each band are more than one master copy applied to it?

A. Oh, yes.

Q. More than one on the same portion of the surface of the band?

A. Just one on the same surface each day.

Q. Then when the roll is put into use again can you put another master copy on the same surface?

A. Just use it over again.

Q. Does the plaintiff company or the company from whom your company obtained these duplicating machines render any service in the operating of those machines to you?

A. Yes, they take care of our machine when occasion
54 requires and give us advice as to the use of the machine and the rolls, and so forth.

The Court: Q. Does that come with the original purchase price or is the service paid for each time?

A. We do not pay for that service except for replacements.

Mr. Wilkinson: Q. Were you with your present company at the time these duplicating machines were installed in use?

A. Yes, I was.

Q. Have you found in their use any advantage over previous methods there practiced in reproducing copies?

A. Yes, we have. Economically we save about 100 per cent. more in the operation of those machines against the carbon paper and ordinary typewriting.

Mr. Wilkinson: You may cross-examine.

Mr. Banning: That is all.

HENRY BAUER, called as a witness on behalf of the plaintiff, being first duly sworn, testified as follows:

Direct Examination by Mr. Wilkinson.

Q. Will you please state your name?

55 A. Henry Bauer.

Q. Your residence? Where do you reside? Where do you live?

A. 5337 Wayne Avenue, Chicago.

Q. That is in Chicago, Illinois, is it?

A. That is right.

Q. What is your occupation, Mr. Bauer?

A. I am office manager of the electrical department of the Chicago Surface Lines.

Q. In your services to said company have you used any form of duplicating machines?

A. Yes, we have them pretty near ten years. We have been using the Duplicator machines.

The Court: Q. That is one like the exhibit here in this case?

Mr. Wilkinson: Exhibit 3.

A. Yes, sir. This is a more newer pattern. Ours is one of the very old ones, one that first came out.

The Court: Q. But made by the same company?

A. Yes, sir, made by the same company.

Mr. Wilkinson: Q. In the use of that machine, Mr. Bauer, after a roller has been unwound in one direction is that same roller used over again?

A. It is the next day.

56 Q. Why the next day?

A. To give the ribbon or the typewritten stuff that is on the roller time to dry up before we use it. We might use it this afternoon and we may be able to use it tomorrow morning again, but we could not use it some more again, I mean an hour after. We could not very well do that.

Q. Have you more than one roll for use on that machine?

A. Yes, we have. Sometimes we have three but always have two on hand.

Q. What is the advantage of having two or three on hand?

A. Because if we have a good deal of work before us, we got to duplicate a whole lot of master sheets, we got to have more than one roller. We might some day duplicate two thousand copies. The next day we might only duplicate one hundred or two hundred copies.

Q. When the roller is again applied to the machine do you have to first rewind the band on the first spindle?

A. No. No. What was the bottom today when we use it tomorrow will be the top end again.

Q. Is there any advantage in that?

57 A. Well, no advantage except—there is no advantage. The only advantage would be perhaps better for the machine to run it back again.

Q. Have you found that the use of the duplicating machine has been of any advantage to you in your work?

A. It has. It has been of a great deal of advantage; a great deal. This machine they claim a great deal for and I claim this machine can do more than it is claimed for. I found this machine very, very satisfactory. We turn out some beautiful pieces of work.

Q. How many copies can you make from a band before it is used up?

A. From a single master sheet we can at times make one hundred and twenty, one hundred and twenty-five, one hundred and thirty copies.

Q. And before the band is useless from wear how many copies can you have made from that band?

A. From the one roll?

Q. Yes, one roll.

A. That is pretty hard to tell. We have one roll or two rolls at the present time in our office that I think we purchased last year, the 10th of June, and today it is being in use yet.

Mr. Wilkinson: That is all the direct. You may
58 cross-examine.

Mr. Banning: No cross-examination.

Mr. Wilkinson: That is our prima facie case, your Honor.

And thereupon the defendant, to maintain the issues on his part, introduced the following evidence, to-wit:—

THEODORE A. HEYER, the defendant, called as a witness on his own behalf, being first duly sworn, testified as follows:

Direct Examination by Mr. Banning.

Q. Please state your name, age, residence and occupation.

A. Theodore A. Heyer; 222 North Lockwood Avenue, Chicago, Illinois.

Q. Your occupation, Mr. Heyer?

A. Wait a minute, I don't know whether I am selling agent for the Beck or a manufacturer.

The Court: Don't be timid about it. So you are of legal age that is sufficient.

A. I am a manufacturer, and also a selling agent
59 for the Beck Duplicator Company of New York City.

Mr. Banning: Q. Are you the defendant in this cause?

A. I am.

Q. Mr. Heyer, on October 29, 1920, this case was reinstated after having been dismissed. I will ask you to state whether since that date you have sold any rolls embodying new spindles as distinguished from spindles of the plaintiff's manufacture.

A. I have not.

Q. Mr. Heyer, does it ever come to your attention that spindles of the plaintiff's manufacture become broken or impaired?

A. They do. I have some with me.

Q. Will you please produce what you have? State what you have there, Mr. Heyer.

A. I have seven spindles that are broken at one end.

Q. Where did you get those spindles?

A. They came from the American Bridge Company.

Q. When did you get them?

A. This morning.

Q. Were those seven broken spindles contained in one consignment?

A. No, sir. There were one hundred and forty—let's see—about one hundred ninety-two spindles, I believe,
60 of which seven were damaged.

Q. Seven out of one hundred and ninety-two were in this damaged condition?

A. I think that is it.

Q. What, if you know, tends to occasion this sort of damage that we find in these spindles?

A. Why, the chuck or cylindrical spindle end has broken off one of them on both ends, the rest only on one end.

Mr. Banning: Your Honor can see it is broken.

The Court: I can see it from here.

Q. What, in your judgment, causes that, wear and tear or mismanagement?

A. Wear and tear.

Mr. Banning: Q. How frequently do these spindles have to be disengaged from the chuck members in the machine ordinarily?

A. When used from end to end.

Q. Am I to understand that these are genuine spindles of the plaintiff's manufacture?

A. They are.

Q. And since October last, when this case was reinstated, that is the only class of spindles which you have been refurnishing with bands and selling?

61 A. That is the only kind.

Q. Mr. Heyer, in the patent in suit this duplicator machine is referred to as a hectograph. What do you understand to be the meaning of the word hectograph?

A. A gelatine composition, either in a pan or on a slate or on a gelatine roll.

Q. For how long a time have you known of the use of gelatine rolls mounted upon spindles in these hectograph machines?

A. Since 1903.

The Court: The only claim that is in suit here, Mr. Banning, is claim 42.

Mr. Banning: That is all, your Honor.

The Court: There is no patent here with reference to the gelatine roll?

Mr. Wilkinson: Not at all.

Mr. Banning: That is all, Mr. Heyer.

I want to offer in evidence those six spindles produced by the witness, to be marked Defendant's Exhibit 1.

The Court: Seven.

The Witness: Seven.

62 *Cross-Examination by Mr. Wilkinson.*

Q. You did not personally see any of those spindles broken which you have produced, did you, Mr. Heyer?

A. I did not.

Q. In what way did those spindles come to you?

A. They were sent to me.

Q. I know, but by express or freight or how?

A. By express.

The Court: Q. How can you tell from looking at those spindles that they were made by the plaintiff company?

A. I cannot tell from that; but I have offered these in evidence, six of them. That should not have been here (indicating). I will offer these in evidence. Their name is on them.

The Court: Q. Where is the name on this one?

A. There is one (indicating). I didn't look at that. I will have to get busy.

The Court: Of course, if the plaintiff's name is on them, that is all.

A. There it is, burned on them. There are two that haven't the plaintiff's name on them. We will lay those aside.

Mr. Wilkinson: Q. So that there are five, then, that
63 you have produced?

A. Five, yes.

Q. Now, Mr. Heyer, did you personally ever see one of the spindles on a roll of plaintiff broken while that roll was being used in the machine?

A. I did.

Q. When?

A. Right in my office.

Q. Were you operating the machine?

A. I was operating the machine.

Q. What experience have you had in operating duplicating machines, a good deal, operated a good many of them, have you?

A. A good many thousand.

Q. Outside of that one instance have you known of spindles breaking in actual use?

A. Oh, yes.

Q. Personally?

A. Yes.

Q. You have operated other—

A. Duplicators.

Q. —of plaintiff's duplicator machines with plaintiff's spindles?

A. I have operated them; yes.

64 Q. What I am getting at is this: Whether you personally in operating the plaintiff's duplicating machines, with plaintiff's rolls, having plaintiff's spindles, ever broke more than the one spindle that you referred to.

A. I never operated a duplicator, a Ditto duplicator, with the plaintiff's roll on. It has always had my roll on. Any time I ever operated it it has always had my roll on.

Q. By your roll what do you mean, Mr. Heyer?

A. I have a sample here if you wish to see it.

Q. You mean your roll, in the sense the band was put on?

A. The band, the roll or the film. It has three names.

Q. I mean this: Did you put the band on spindles of plaintiff?

A. I did.

Q. It was one of the bands which you had applied to plaintiff's spindles which you saw broken in use, was it?

A. That I cannot say.

Q. So that really, then, you cannot say, Mr. Heyer, whether or not that spindle which you personally saw broken in use was a spindle which had been made by
65 the plaintiff?

A. That spindle was made by the plaintiff.

Mr. Wilkinson: The question is repeated. Will you read the question?

(The question was read.)

A. Oh, it was.

The Court: The spindle was, but it may not have had the plaintiff's roll on it.

Mr. Wilkinson: Q. When you apply the bands to plaintiff's spindles do you supply different widths of bands to the same widths of spindles, as customers may desire?

A. I do.

Q. Since this suit was reinstated your entire business has been in applying new duplicating bands to spindles which plaintiff has made?

A. No, sir. It has not. About ten per cent. of my business has been that. I manufacture hectograph and stencil paper for the mimeograph.

Q. My question was a little too broad, Mr. Heyer. What I meant was whether in your business in making rolls for use on the plaintiff's commercial machine you have since the suit was reinstated merely applied a new band to spindles which were made by the plaintiff.

66 A. I do, yes.

Q. That has been all you have done in that line?

A. Oh, no, I have done other things.

Q. So that the rolls you put out do embody plaintiff's spindles which have been previously used and were not broken in their previous use?

A. I renew them. I put a new band on the old spindles.

Q. And the spindles which you put out with the new bands on have been spindles which have been used previously on other bands?

A. Yes.

The Court: Q. That is, anybody operating plaintiff's

machine, if he sends you in one of the plaintiff's rolls and says, "I want a new band on it," you put it on?

A. I put it on.

Mr. Wilkinson: Q. Mr. Heyer, why is it that in furnishing new bands on old spindles you furnish different widths of bands on the same width of spindles?

A. Because the order of the customer asks for them. It is a matter of an order; that is all. If he wants an eight and three-quarter inch roll on a fourteen inch spindle I follow his orders.

Mr. Wilkinson: That is all, Mr. Heyer.

67 The Court: Was there any stipulation entered into or any condition imposed by the court when this case was reinstated?

Mr. Wilkinson: The accounting was cut off prior to the date of reinstatement.

The Court: That is what I want to get at.

Redirect Examination by Mr. Banning.

Q. Mr. Heyer, since the date of reinstatement what means have you adopted for securing possession of the old spindles manufactured by the plaintiff?

A. I have sent out letters stating that I would pay six cents apiece for old spindles, and they gladly send them in to me in preference to sending them to the Duplicator Manufacturing Company, who only pay three cents apiece. They will buy them for three cents and I pay six.

Q. And the spindles which were received in response to that solicitation are the ones you have used since the date of reinstatement?

A. Yes, sir; they are the ones.

Mr. Banning: That is all.

We have a few patents.

68 The Court: What is the real quarrel about in this case, gentlemen? What is the real quarrel about now? If the accounting is to be limited to infringement subsequent to the reinstatement of the case on the evidence here it is perfectly apparent to the Court that there is nothing to be recovered, because there is no proof of any infringement subsequent to the reinstatement of the case.

Mr. Wilkinson: Your Honor, we contend, and I think we are right in doing so in view of the authorities, that the defendant infringes in two ways. One way in applying new

bands to plaintiff's spindles, inasmuch as the band is one of the three elements of the invention, and that band is associated with the other two elements in making the invention. So that we contend that there has been infringement by the defendant since reinstatement through his act in applying new bands to the spindles, then furnishing those spindles presumably to plaintiff's customers. Also, so far as acts prior to that date are concerned, I think we would be entitled to a judgment as to whether or not that was infringement, and have them enjoined, if it was infringement, against continuing that.

The Court: Go ahead, Mr. Banning.

69 Mr. Banning: The following patents are offered, to be marked Defendant's Exhibit 2.

No. 237158, February 1, 1881, Bendall.
No. 373800, November 22, 1887, Dooley.
No. 485275, November 1, 1892, Hanson.
No. 577369, February 16, 1897, McIntire.
No. 646112, March 27, 1900, Taylor.
No. 698157, April 22, 1902, Thornton.
No. 758322, April 26, 1904, Krause.

Defendant rests.

And thereupon the plaintiff, further to maintain the issues on its part, introduced the following evidence in rebuttal, to-wit:

HAROLD WRIGHT, recalled as a witness on behalf of the plaintiff, testified as follows:

Direct Examination by Mr. Wilkinson.

Q. How long have the duplicating machines which your company obtained from the plaintiff been in use under your supervision?

A. About ten years.

70 Q. During that period of ten years have the spindles on the rolls broken?

A. I have never heard of any of them breaking. I have never seen a broken one.

Mr. Wilkinson: That is all, Mr. Wright.

Mr. Banning: That is all.

GUY H. ABBOTT, recalled as a witness on behalf of the plaintiff, testified as follows:

Direct Examination by Mr. Wilkinson.

Q. Mr. Abbott, to what extent have you personally seen these plaintiff's duplicating machines used?

A. Why, I see them every day used in our own work, in our own office.

Q. Have you known of spindles on the rolls being broken in usage?

A. I never knew of one. I never knew of anywhere any spindle being broken in use.

Mr. Wilkinson: That is all.

71 *Cross-Examination by Mr. Banning.*

Q. Mr. Abbott, of the entire number of rolls and spindles that you furnish to your customers about what per cent. actually come back to you for being refurnished with bands?

A. You mean spindles?

Q. Yes, what percentage of the actual number of spindles sent out actually come back to be refurnished?

A. Well, that is pretty difficult to say. A few years ago I did keep a record of that which showed from 35 to 50 per cent., sometimes a little higher. Whether that percentage would run lower or higher now I could not tell. We get back a great many.

Q. A very substantial number, however, after you have sold them never come back to you?

A. That is true; yes.

Mr. Banning: That is all.

Mr. Wilkinson: That is all, Mr. Abbott.

I have nothing further.

Which was all the evidence offered or received on the hearing of said cause.

72 LIST OF EXHIBITS.

	Offered at page
Plaintiff's Exhibit No. 1	2
Plaintiff's Exhibit No. 2	2
Plaintiff's Exhibit No. 3	2
Plaintiff's Exhibit No. 4	2
Plaintiff's Exhibit No. 5	3
Plaintiff's Exhibit No. 6	4
Plaintiff's Exhibit No. 7	4
Plaintiff's Exhibit No. 8	4
Plaintiff's Exhibit No. 9	5
Plaintiff's Exhibit No. 10	5
Defendant's Exhibit No. 1	31
Defendant's Exhibit No. 2	39

73 And on to-wit: sixteenth day of May, 1921, there was filed in the Clerk's office of said court a certain Memorandum, in words and figures following to-wit:

74 IN THE DISTRICT COURT OF THE UNITED STATES,

For the Northern District of Illinois,

Eastern Division.

Duplicator Manufacturing Company,
Plaintiff,
vs.
Theodore A. Heyer,
Defendant.
} Equity No. 956.

May 16, 1921.

Memorandum, Carpenter, J.

You may by combination of old things produce a new result, The law rewards your genius with a patent monopoly. You may exclude others from making, using or vending your combination. Your grant or monopoly, however does not permit you to forbid the manufacure and sale of the old elements for any purpose and to all people.

The only question in this case is that of contributory infringement. As I understand it the doctrine of contributory

infringement applies only to the sale of a part which is intended for use in a machine which is manufactured without of right from the patentee, and which results in the building of a device embodying the complete patented combination.

It is quite conceivable that an intricate piece of machinery may be made more effective by the introduction of a little set screw particularly placed. No one had ever thought of it before. The participants in the art were astonished at its simplicity; no one, however, could deny the new and use-
75 ful result. Is it possible that the screw maker may be prevented from manufacturing that screw which had been used for other purposes for many years, and forbidden the ordinary channels of sale because the patentee has discovered a new use for that particular screw?

This case involved a question of repair rather than infringement. If one of the essential members of a machine is broken, and a clamp is put on each side to keep it in place and give it operation, that is repair. If a new member is introduced another question is involved, if the new member is the subject of a patent. The replacement of an essential element of a patented combination is not an infringement of the patent where the operator of the device has used the combination with the sanction of the patentee.

The record in this case does not show infringement, and for that reason the bill will be dismissed for want of equity, and a decree may be prepared accordingly.

75½ And on to-wit: the 20th day of May, 1921, the following order was entered by the Court:

76 IN THE UNITED STATES DISTRICT COURT

Northern District of Illinois

Eastern Division

Friday, May 20, 1921.

Present: Honorable George A. Carpenter, District Judge.

Duplicator Manufacturing Company, *Plaintiff*,
vs.
Theodore A. Heyer, *Defendant*.
} In Equity No. 956.

ORDER OF DISMISSAL.

This cause coming on for final hearing on the pleadings, proofs and exhibits submitted on behalf of the plaintiff and defendant, respectively, and the parties being duly represented by counsel, and the court having heard arguments on behalf of the respective parties, and being fully advised in the premises,

It Is Hereby Ordered, Adjudged and Decreed that the bill of complaint be and the same is hereby dismissed for want of equity at plaintiff's costs to be duly taxed.

Enter

CARPENTER
Judge.

Chicago, Illinois, May 20th, 1921.

77 And on to-wit: the 22nd day of June, 1921, there was filed in the office of the Clerk of said Court a certain Petition for Appeal in words and figures following to-wit:

78 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company,
Complainant.

vs.

Theodore A. Heyer, doing business der the name of T. A. Heyer Duplicator Company,
Defendant.

} In Equity #956.

PETITION FOR APPEAL

To Honorable George A. Carpenter, District Judge.

The above named plaintiff, Duplicator Manufacturing Company feeling aggrieved by the Decree rendered and entered in the above-entitled cause on the 20th day of May, A. D. 79 1921, does hereby appeal from said Decree to the Circuit of Appeals for the 7th Circuit for the reasons set forth in the Assignment of Errors filed herewith, and prays that its appeal be allowed and that citation be issued as provided by law, and that a transcript of the record proceedings and documents upon which said Decree was based, duly authenticated, be sent to the United States Circuit Court of Appeals for the 7th Circuit under the rules of such Court in such cases made and provided.

DUPLICATOR MANUFACTURING COMPANY,
By JAMES A. JOY,
President.

Appeal allowed upon giving bond as required by law for the sum of Two Hundred Dollars ($200.00).

CARPENTER
Judge.

22 June 1921

(Endorsed) Filed June 22, 1921 John H. R. Jamar, Clerk.

86 And on to-wit: the 22nd day of June, 1921, there was filed in the office of the clerk of said court a certain Assignment of Errors, in words and figures following to-wit:

87 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company, *Complainant,*
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, *Defendant.*
} In Equity, # 956.

ASSIGNMENT OF ERRORS.

Now comes the Plaintiff in the above entitled cause and files the following assignment of errors upon which it will rely upon its prosecution of the Appeal in the above-entitled cause from the Decree made by this Honorable Court on the 20th day of May, 1921.

1. That the Court erred in dismissing the Bill of Complaint and in denying to Plaintiff the relief thereby prayed.
2. That the Court erred in holding and deciding that this cause involves a question of repair rather than infringement.

88 3. That the Court erred in holding that the replacement of an essential element of a patented combination is not an infringement of the patent where the operator of the device has used the combination with the sanction of the patentee.

4. That the Court erred in holding and deciding that the record in this case does not show infringement.
5. That the Court erred in not holding and deciding that the manufacture and sale by the Defendant of spools and bands for Plaintiff's duplicating machines constituted a contributory infringement of claim 42 of Plaintiff's patent.

6. That the Court erred in not holding and deciding that the sale of duplicating bands for use on Plaintiff's duplicating machines constituted a contributory infringement of Plaintiff's patent.

Wherefore the appellant prays that said Decree be reversed, and that said District Court for the Northern District of Illinois, Eastern Division be ordered to enter a Decree reversing the decision of the lower court.

DUPLICATOR MANUFACTURING COMPANY.
By GEO L. WILKINSON
SAMUEL U. POND
Solicitors for Plaintiff.

Chicago, Illinois,
June 21, 1921.

(Endorsed) Filed Jun 22 1921 John H. R. Jamar, Clerk.

82 And on to-wit: the 22nd day of June, 1921, comes James
31. A. Joy as principal and Guy H. Abbott and John J. Flanigan, as sureties, and filed in the Clerk's office of said Court, in said entitled cause, a certain Bond on Appeal in words and figures following, to-wit:

83 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Complainant,
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity, #956.

BOND ON APPEAL.

Know All Men by These Presents, that we, James A. Joy as principal, and Guy H. Abbott, and John J. Flanigan, as

sureties, of the County of Cook, State of Illinois, are held and firmly bound unto Theodore A. Heyer, in the sum of Two Hundred Dollars ($200.00) lawful money of the United States, to be paid to him and his executor, administrator and successors in business; to which payment well and truly
84 to be made we bind ourselves and each of us jointly and severally, and each of our heirs, executors, and administrators, by these presents.

Sealed with our seals and dated this 13th day of June, 1921.

Whereas, the above-named Duplicator Manufacturing Company has prosecuted an Appeal to the United States Circuit Court of Appeals of the 7th Circuit to reverse the judgment of the District Court for the Northern District of Illinois, Eastern Division in the above-entitled cause;

Now, Therefore, the condition of this obligation is such that if the above-named Duplicator Manufacturing Company shall prosecute its said Appeal to effect and answer all costs if it fail to make good its plea, then this obligation shall be void; otherwise to remain in full force and effect.

JAMES A. JOY (Seal)
GUY H. ABBOTT (Seal)
JOHN J. FLANIGAN (Seal)

The within bond is approved both as to sufficiency and form this 22nd day of June 1921.

GEORGE A. CARPENTER
Judge.

85 State of Illinois } ss.
County of Cook. }

On the 13th day of June, 1921, personally appeared before me, James A. Joy, Guy H. Abbott and John J. Flanigan, personally known to me to be the persons described in and who duly executed the foregoing instrument as parties thereto and respectively acknowledged each for himself, that they executed the same as their free act and deed for the purposes therein set forth.

And the said James A. Joy, Guy H. Abbott and John J. Flanigan, being respectively by me duly sworn, says each for himself and not one for the other, that he is a resident and householder of the said County of Cook, and that he is worth the sum of Two Hundred Dollars ($200.00) over and above

his just debts and legal liability and property exempt from execution.

JAMES A. JOY (Seal)
GUY H. ABBOTT (Seal)
JOHN J. FLANIGAN (Seal)

Subscribed and sworn to before me this 13 day of June, 1921.

THOMAS I. HANTON
(Seal) *Notary Public.*

(Endorsed) Filed Jun 22, 1921 John H. R. Jamar Clerk.

1921. 80 And on to-wit: the 22nd day of June, 1921, there was entered by the court the following order:

81 IN THE DISTRICT COURT OF THE UNITED STATES

For the Northern District of Illinois,

Eastern Division.

Wednesday, June 22, 1921.

Present: Honorable George A. Carpenter, District Judge.

Duplicator Manufacturing Company, *Plaintiff,*
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, *Defendant.*
} In Equity No. 956.

This day comes the plaintiff by its attorneys, and presents to the Court its Petition for Appeal, Assignment of Errors and Bond in the sum of Two Hundred Dollars ($200.00), and moves the Court for the allowance of an Appeal from the Decree entered herein on the twentieth day of May, 1921.

It Is Ordered by the Court that the Bond, this day presented, be and it is hereby approved, and that an Appeal be allowed to the United States Circuit Court of Appeals from the decree, heretofore entered herein.

89 And on to-wit: the 27th day of July, 1921, there was filed in the clerk's office of said court a certain Stipulation, in words and figures following to-wit: Fil 1

90 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Plaintiff.
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity No. 956.

STIPULATION.

It is hereby stipulated and agreed by and between counsel that, with the consent of the Court, the time for filing the record with the Clerk of the Court of Appeals in the above entitled cause may be extended to and including August 22, 1921; and that this stipulation may be received nunc pro tunc as if filed July 22, 1921.

It is further stipulated and agreed that, with the consent of the Court, the testimony, being very brief, may be certified to the Court of Appeals without condensation and reduction to narrative form.

GEO. L. WILKINSON,
SAMUEL N. POND,
Solicitors for Plaintiff-Appellant.
BANNING & BANNING,
Solicitors for Defendant-Appellee.

Approved:
S. ALSCHULER,
Judge.

(Endorsed) Filed Jul 27, 1921 John H R Jamar Clerk.

91 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division.

Duplicator Manufacturing Company, *Plaintiff.*
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, *Defendant.*
} In Equity No. 956.

PRAECIPE.

To the Clerk of the District Court:

You will please make a transcript of the Record in the above-entitled cause, for transmission to the United States Circuit Court of Appeals for the Seventh Circuit, and include therein the following:

The Bill of Complaint;
The Answer;
Petition to Reinstate;
Affidavits in Support of Same;
Order by Agreement Reinstating Case;
The Testimony of Witnesses and other proceedings before Trial Court as found on pages 1 to 41 inclusive of the typewritten copy of the Record of the Trial.
Plaintiff's Exhibits, as follows:
Exhibit No. 1—Copy of the patent in suit.
Exhibit No. 2—Assignment of Title to Plaintiff.
92 Exhibit No. 6—Defendant's Circular.
Exhibit No. 7—Defendant's letter to a user.
Exhibit No. 8—Defendant's letter to a customer of Plaintiff.
Exhibit No. 9—Defendant's letter to a customer of Plaintiff.
Defendant's Exhibit No. 2, comprising copies of the the following patents:

No. 237,158	February	1, 1881,	Bendall,
373,800	November	22, 1887,	Dooley,
485,275	November	1, 1892,	Hanson,
577,369	February	16, 1897,	McIntire,
646,112	March	27, 1900,	Taylor,
698,157	April	22, 1902,	Thornton,
758,322	April	26, 1904,	Krause.

The Memorandum Opinion of the Court,
Order of Dismissal,
Petition for Appeal, and order allowing same.
Bond on Appeal,
Assignment of Errors,
Citation,
Stipulation, extending Time for Filing Transcript of Record in Court of Appeals,
Praecipe.

You will please certify to the United States Circuit Court of Appeals the following exhibits as physical exhibits:

Plaintiff's Exhibits:
No. 3, Plaintiff's Commercial Duplicator,
No. 10, Plaintiff's Instruction Book.
Defendant's Exhibit:
No. 1, Spindles produced by Defendant's witness—Theodore A. Heyer.

GEO L. WILKINSON,
SAMUEL N. POND,
Counsel for Plaintiff Appellant.

93 Service of the above Praecipe received and a copy thereof acknowledged this 4th day of August, 1921.

BANNING & BANNING,
Counsel for Defendant Appellee.

Approved:
BANNING & BANNING,
Counsel for Defendant Appellee.

(Endorsed) Filed Aug 4, 1921 John H R Jamar, Clerk.

97 Northern District of Illinois } ss.
Eastern Division }

I, John H. R. Jamar, Clerk of the District Court of the United States for the Northern District of Illinois, do hereby certify the above and foregoing to be a true and complete transcript of the proceedings had of record made in accordance with Praecipe filed in this Court in the cause entitled Duplicator Manufacturing Company, Plaintiff, vs. Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, Defendant, In Equity No. 956, as the same appear from the original records and files thereof, now remaining in my custody and control.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said Court at my office, in the City of Chicago, in said District, this 8th day of August A. D. 1921.

JOHN H. R. JAMAR,
Clerk.

(Seal)

94 IN THE DISTRICT COURT OF THE UNITED STATES

Northern District of Illinois

Eastern Division

Duplicator Manufacturing Company,
Complainant.
vs.
Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company,
Defendant.
} In Equity No. 956.

CITATION.

United States of America, } ss.

To Theodore A. Heyer, Greeting:

You are hereby cited and admonished to be and appear before the United States Circuit Court of Appeals for the Seventh Circuit to be held at the City of Chicago, State of Illinois on the 22nd day of July, A. D., 1921 pursuant to an order allowing an appeal filed and entered in the Clerk's Office of

the District Court of the United States for the Northern District of Illinois, Eastern Division, from a final decree filed and entered on the 20th day of May, A. D., 1920, in that
95 certain suit being in equity No. 956, wherein you are Defendant and Duplicator Manufacturing Company is Plaintiff-Appellant, to show cause, if any there be, why the decree rendered against the said appellant as in said order allowing appeal mentioned, should not be corrected and why justice should not be done to the parties in that behalf.

Witness the Honorable George A. Carpenter, United States District Judge for the Northern District of Illinois, this 22nd day of June, 1921, and of the Independence of the United States One Hundred and Forty-Fifth year.

GEORGE A. CARPENTER,
United States District Judge for the Northern District of Illinois.

Service of the above citation and receipt of copy thereof acknowledged this 22nd day of June, A. D., 1921.

BANNING & BANNING,
Solicitors for Defendant-Appellee.

96 956 District Court of United States Northern District of Illinois Eastern Division Duplicator Manufacturing Company, Complainant, vs. Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, Defendant. Equity #956. Citation George L. Wilkinson Samuel N. Pond Solicitors for Complainant. Filed Jun 22 1921 at __ o'clock __ M. John H. R. Jamar, Clerk.

118 DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE

Received and Recorded on the 23rd day of December, 1910, in Liber Y,85, page 269 of Transfers of Patents.

In Testimony Whereof, I have caused the seal of the Patent Office to be hereunto affixed.

E. B. MOORE,
Commissioner of Patents.

(Seal)

ASSIGNMENT.

Whereas I, John J. Flanigan, of Chicago, County of Cook, and State of Illinois, did obtain letters patent of the United States for improvements in Multiple Copying Machines, which letters patent are numbered 965,887, and bear date the 2nd day of August in the year 1910;

And Whereas I am now the sole owner of said patent and of all rights under the same;

And Whereas Duplicator Manufacturing Company, a corporation organized and existing under and by virtue of the laws of the State of West Virginia, and having an office and place of business in the City of Chicago, Illinois, is desirous of acquiring the entire interest in the same;

Now, Therefore, to all whom it may concern, be it known that for and in consideration of the sum of One Dollar ($1.00) and other good and valuable considerations to me in hand paid, the receipt of which is hereby acknowledged, I, the said John J. Flanigan, have sold, assigned and transferred, and by these presents do sell, assign and transfer unto the said Duplicator Manufacturing Company, its successors and assigns, the whole right, title and interest in and to the

119 said improvements in Multiple Copying Machines and in and to the letters patent therefor aforesaid; the same to be held and enjoyed by the said Duplicator Manufacturing Company for its own use and behoof, and for the use and behoof of its legal representatives, to the full end of the term for which said letters patent are or may be granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

In Testimony Whereof I have hereunto set my hand and affixed my seal at Chicago, in the County of Cook and State of Illinois, this 17th day of December, 1910.

JOHN J. FLANIGAN (Seal)

State of Illinois } ss.
County of Cook }

I, G. L. Toale, a Notary Public in and for the County and State aforesaid, do hereby certify that John J. Flanigan, personally known to me to be the same person whose name is subscribed to the foregoing instrument of writing, appeared before me this day in person and acknowledged that he signed, sealed and delivered the said instrument of writing as his free and voluntary act, for the uses and purposes therein set forth.

In Witness Whereof I have hereunto set my hand and notarial seal, this 17th day of December A. D. 1910.

G. L. TOALE,
Notary Public.

U. S. Patent Office Dec. 23, 1910. Recorded

553-56

J. J. FLANIGAN.

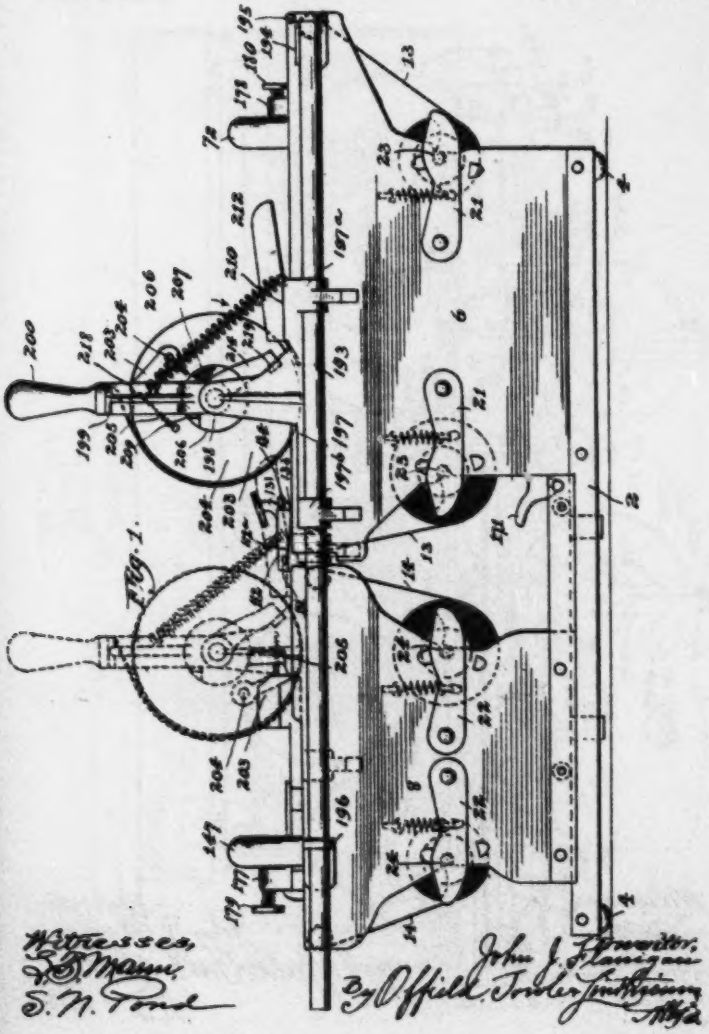
MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 6, 1909.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 1.



Witnesses,
H. B. Mann.
S. N. Ford

John J. Flanigan.
By Offield, Towler, Smith & Dame
Atty's.

57&58

J. J. FLANIGAN.

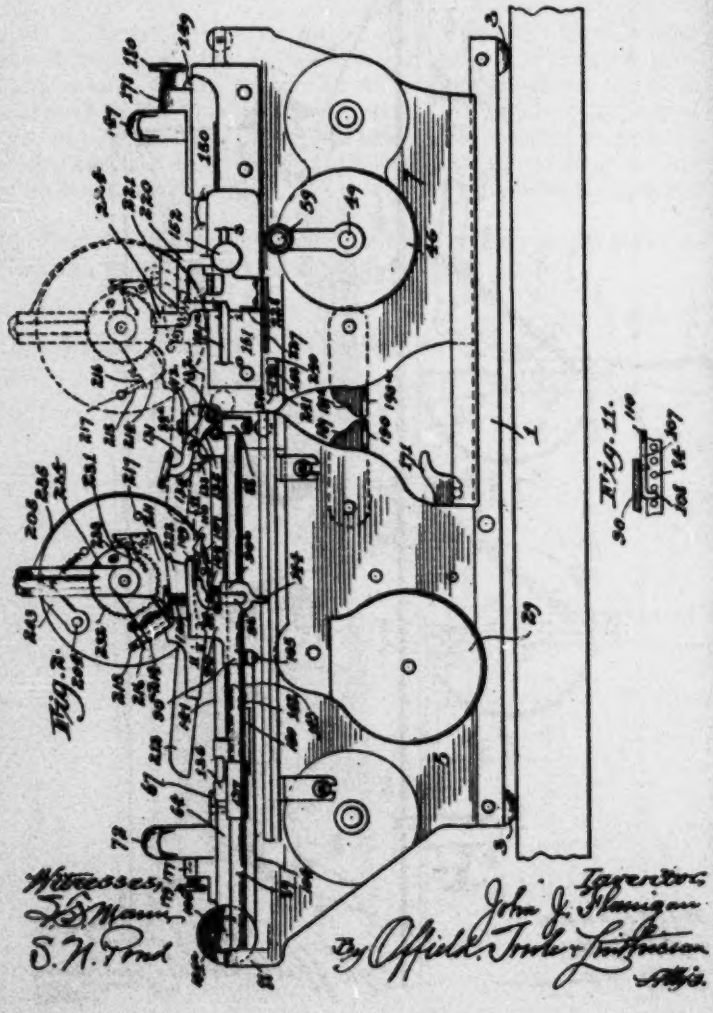
MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 6, 1909.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 1.



Witnesses:
F. D. Mann
S. N. Pond

Inventor:
John J. Flanigan
By Offield, Towle & Linthicum
Attys.

J. J. FLANIGAN.

59&60

MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 6, 1906.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 3.

Fig. 3

Witnesses,
S. N. Pond

Inventor,
John J. Flanigan
By Offield Towle & Linthicum
Attys

61&62

J. J. FLANIGAN.

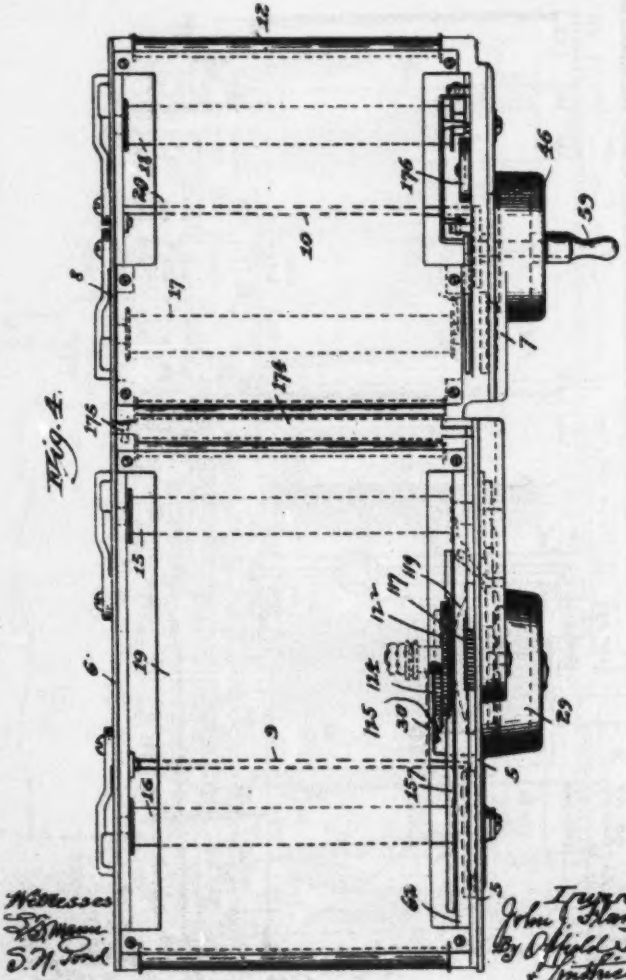
MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 5, 1906.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 4.



63&64

J. J. FLANIGAN.

MULTIPLE COPYING MACHINE.

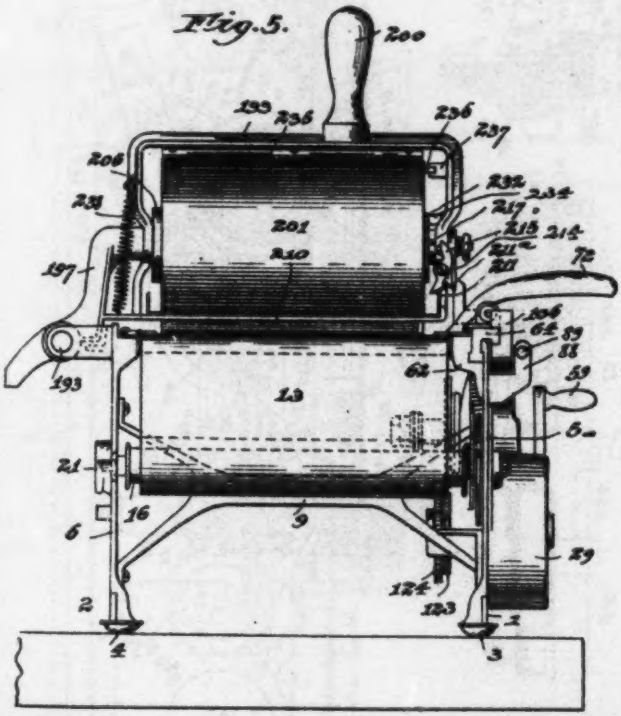
APPLICATION FILED DEC. 5, 1908.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 5.

Fig. 5.



Witnesses,
H. C. Mann.
S. N. Pond.

Inventor,
John J. Flanigan
By Offield, Towler, Linthicum & Offield.
Attys.

65&66

J. J. FLANIGAN.

MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 4, 1909.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 4.

Fig. 10.

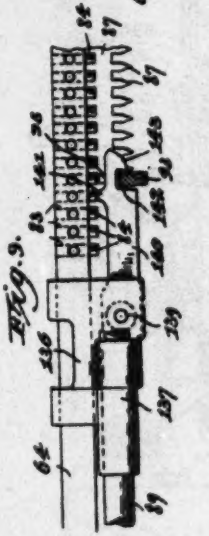


Fig. 9.

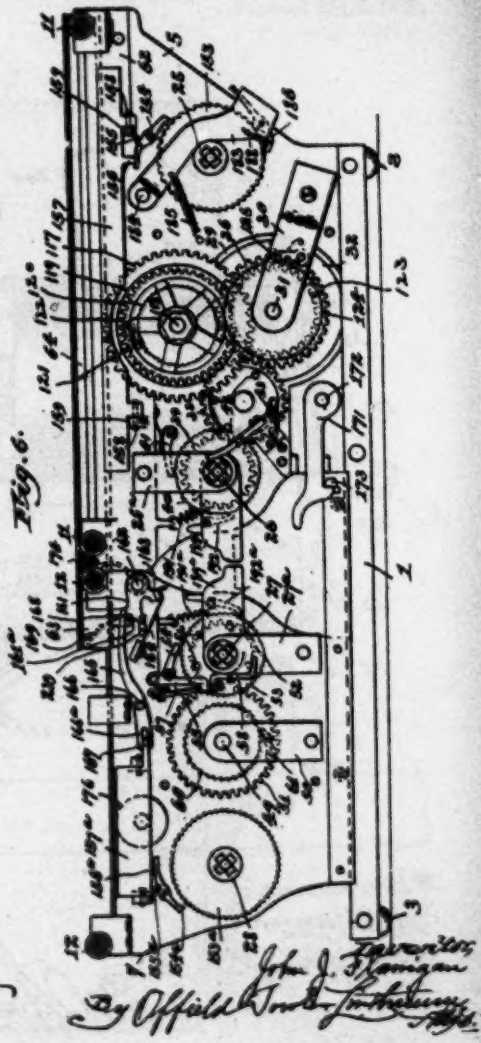


Fig. 6.

Witnesses,
F. D. Mann.
S. N. Ford.

John J. Flanigan
By Offield Ford Fackler & Brown
Attys.

J. J. FLANIGAN.

67&68

MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 6, 1909.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 7.

Fig. 7.

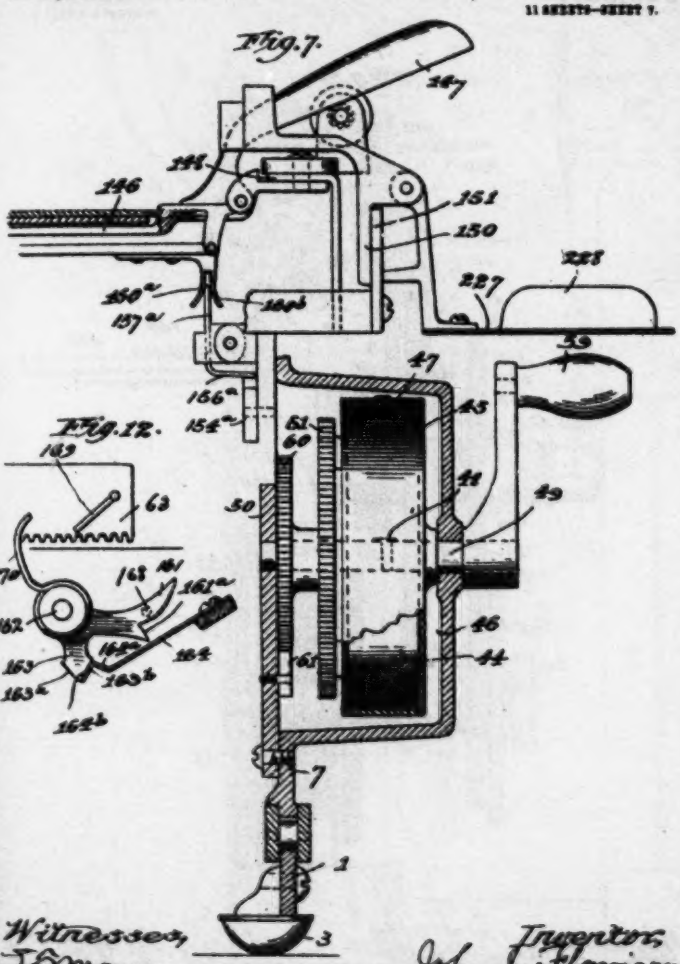


Fig. 12.

Witnesses,
F. S. Mann.
S. N. Pond

Inventor,
John J. Flanigan
By Offield, Towler, Linthicum & Offield
Att'ys.

69&70

J. J. FLANIGAN.

MULTIPLE COPYING MACHINE.

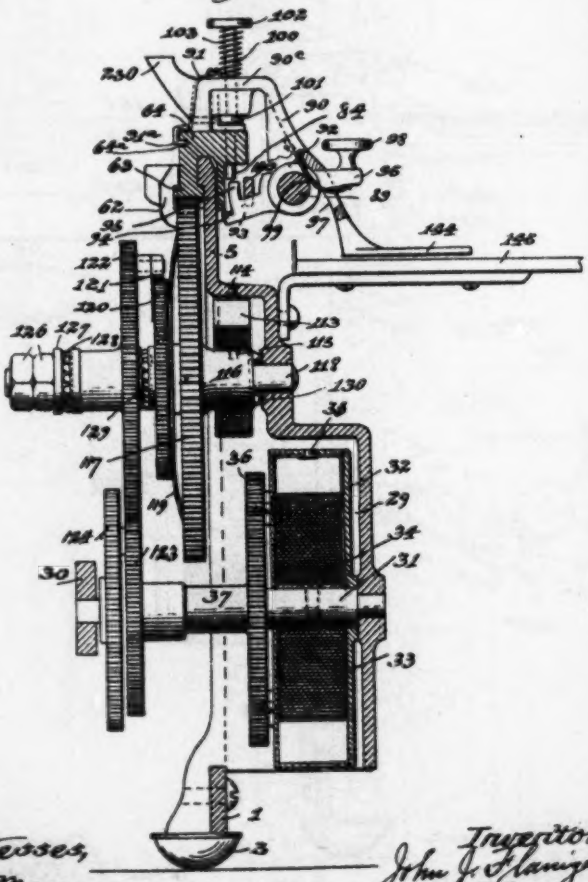
APPLICATION FILED DEC. 8, 1908.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 8.

Fig. 8.



Witnesses,

F. L. Mann

S. N. Pond

Inventor,

John J. Flanigan

By Offield, Towler, Lothrop & Offield

Attys

J. J. FLANIGAN.

71&72

MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 5, 1908.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 9.

Witnesses,
H. E. Mann.
S. N. Pond.

Inventor,
John J. Flanigan.
By Offield, Towler & Linthicum
Attys.

73&74

J. J. FLANIGAN.

MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 6, 1909.

965,887.

Patented Aug. 2, 1910.

11 SHEETS—SHEET 15.

Fig. 15.

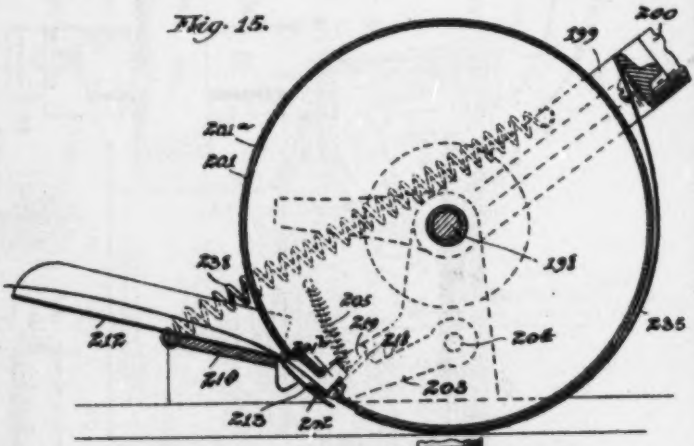
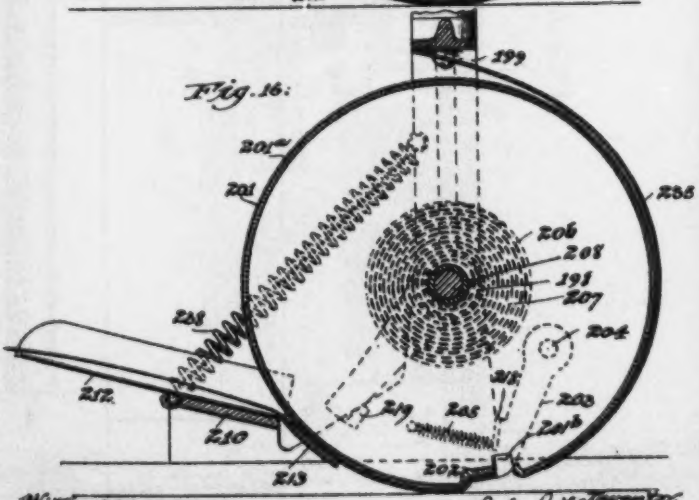


Fig. 16.



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MULTIPLE COPYING MACHINE.

APPLICATION FILED DEC. 6, 1906.

985,887. Patented Aug. 2, 1910.

11 SHEETS—SHEET 11.

Fig. 19.

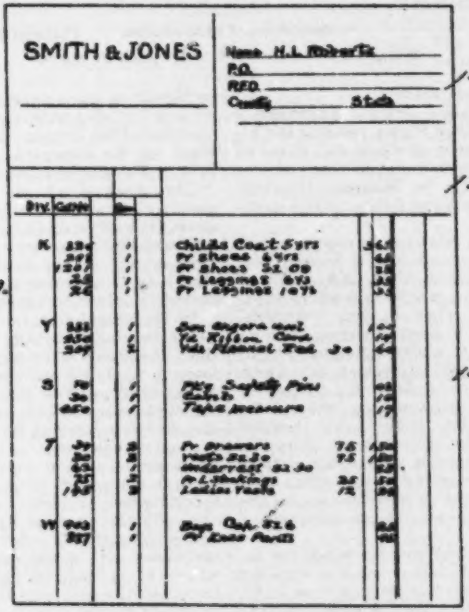
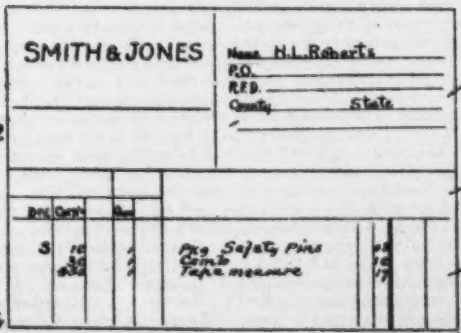


Fig. 20.



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UNITED STATES PATENT OFFICE.

JOHN J. FLANIGAN, OF CHICAGO, ILLINOIS.

MULTIPLE COPYING-MACHINE.

965,887. Specification of Letters Patent. Patented Aug. 2, 1910.

Application filed December 8, 1906. Serial No. 346,132.

To all whom it may concern:

Be it known that I, JOHN J. FLANIGAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Multiple Copying-Machines, of which the following is a specification.

This invention relates to improvements in multiple copying machines, or hectographs, as they are sometimes called, and has for its principal object to provide a machine capable of effecting what I term "sectional copying" under a single common head or caption. In other words, the object sought is to produce a copying machine onto which a transfer may be made of the written or printed matter contained on one master sheet or document, which latter contains certain data at the top commonly known as the heading or caption, and which data is common to and required in connection with portions of sections of other matter on the same sheet, so as to produce therewith a complete record.

One of the leading uses for which my invention is designed is in connection with the clerical work of mail order and other large commercial houses. By the usual methods of commercial houses departmental orders are made for that portion of the goods contained in any order which must be furnished from each department; and it is therefore necessary to repeat the caption data or information on each several departmental order. These departmental orders are made from the original customer's order, and after the goods have been packed and shipped the departmental orders are returned to the billing department and invoices of the whole shipment made from the several departmental orders. On this invoice, of course, the heading or caption appears but once, and the items furnished by each department, together with expenses, etc., are taken from the completed departmental orders. The machine of the present invention is designed to receive an impression of the caption and several groups of departmental orders that may be compiled in an invoice at the first writing, and then produce departmental copies of the caption and of that group or section of the items which is to be furnished by each of the respective departments. The machine is also designed to furnish as many copies as may be required of any and all portions or combinations of portions of the original document or master sheet for the numerous purposes to which such copies may be utilized to advantage.

The machine of my invention, while chiefly designed for the purpose above outlined, is capable of use generally wherever sectional copying under a single or common head or caption may be required as, for instance, in transferring day-book or journal entries to ledger accounts.

In its general features the machine comprises two longitudinally alined frame-sections, preferably made separable for convenience in applying and removing the duplicating bands, one of said sections carrying the duplicating band to receive the caption and the other carrying the duplicating band to receive the items or groups of items. Each section of the machine has mounted thereon a band-gripping device slidable in the direction of travel of the bands and clamping the opposite edges of the latter. The gripper that engages the caption band coöperates with a stop device on the frame which determines and limits the extent of travel of the said band according to the length of the individual caption to be impressed thereon. The gripper engaging the other duplicating band is rigid with a longitudinally slidable spring-actuated bar that carries a series of stop-pins coöperating with a fixed stop on the frame, and also with an indicator device which determines from the master sheet the several stop-pins that are to be used in the step-by-step advance of the duplicating band according to the length of the several items or groups of items on the master sheet, and also throws said pins into and out of operative position for coöperation with a fixed stop on the frame. The receiving rolls of the duplicating bands are preferably both under spring tension tending to wind them up, and suitable detent devices thrown into action upon the release of the clamps arrest the winding of the bands when the clamps are released and slipped back for a fresh hold on the bands.

In the accompanying drawings and the following detailed description thereof I have sought to disclose one practical mechanical form in which the principle of the invention may be embodied: but it will be understood that in many of the details of

construction the machine illustrated might be modified without involving any departure from its principle of operation or any variation from the substantial features of the invention.

Referring, then, to the drawings, Figure 1 is an elevational view of the machine from one side thereof. Fig. 2 is a similar elevational view from the opposite side thereof. Fig. 3 is a top plan view of the machine. Fig. 4 is a top plan view of the machine, omitting the duplicating bands and other details of the mechanism for the sake of clearness. Fig. 5 is an elevational view of one end of the machine. Fig. 6 is a longitudinal section, showing in elevation the inner side of one of the main side-frame members of the machine and the mechanism carried thereby. Fig. 7 is a fragmentary cross-sectional view, on an enlarged scale, through that section of the machine adapted to receive and transmit the impression of the heading or caption. Fig. 8 is a cross-sectional view similar to Fig. 7 through that section of the machine adapted to receive and transmit the impressions of the items or groups of items under the heading or caption. Fig. 9 is an enlarged broken detail, partly in section, of the automatic selective stop mechanism controlling the movement of the item-duplicating band. Fig. 10 is a cross-sectional detail through the last-mentioned mechanism. Fig. 11 is a detail horizontal section on the line 11—11 of Fig. 9, looking downwardly. Fig. 12 is a detail elevation of an interlocking device controlling the relative movements of the band-gripping devices. Figs. 13 and 14 are, respectively, a longitudinal section and top plan of one of the gripping devices of the duplicating bands. Figs. 15 and 16 are cross-sectional views of the platen cylinder and the mechanism carried thereby for clamping and releasing the sheet on or from which a copy is to be made. Fig. 17 is a side elevation of one of the spools of the duplicating band. Fig. 18 is an end elevation of the spool shown in Fig. 17. Fig. 19 is a plan view of a master-sheet, from which sectional copies are designed to be made by the machine, each having the same heading or caption. Fig. 20 is a similar view of one of such sectional copies.

Referring to the drawings for a detail description of the mechanism, 1 and 2 designate a pair of parallel horizontal bars supported at their ends on feet 3 and 4, respectively, and constituting the main rests or supports for the machine frame and parts carried thereby. To the bars 1 and 2 are rigidly secured at one end of the latter the main upright side-frame members 5 and 6 of that section of the machine designed to carry what I shall hereinafter term the "item" duplicating band; while the other portions of the bars 1 and 2 constitute a track or slideway for the side-frame members 7 and 8 of the other section carrying what I shall hereinafter term the "caption" duplicating band. The side-frame members 5 and 6 are rigidly connected and spaced by a transverse brace 9 (Figs. 4 and 5), and a similar transverse brace 10 connects and spaces the side-frame members 7 and 8 of the other frame section. The side-frame members of the two sections are further connected and spaced at their inner and outer ends by rods 11 and 12 (Fig. 6) which are rotatably mounted in said frame-members and serve as guide rollers for the duplicating bands 13 and 14 (Fig. 3). The item-duplicating band 13 is wound on receiving and delivering spools 15 and 16, respectively (Fig. 4), and the caption-duplicating band 14 is similarly wound on receiving and delivery spools 17 and 18, respectively, the intermediate or flat working sections of the two bands being supported on horizontal beds 19 and 20 suitably secured to and between the side-frame members. The several spools 15, 16, 17 and 18 are all alike, and one of said spools is illustrated in detail in Figs. 17 and 18, from which it will be seen that the heads of the spools have formed thereon or otherwise rigid therewith a longitudinally projecting squared portion 15^a, and projecting longitudinally of the latter a cylindrical bearing spindle 15^b that is coaxial with the body of the spool, the two ends of the spool being duplicates. The several spools are removably journaled at one end by their spindles 15^b in pivoted spring-actuated arms 21 and 22 (Fig. 1) mounted on the outer sides of the side-frame members 6 and 8, respectively, each of said arms having formed therein a half-journal coöperating with semi-circular notches 23 and 24 formed in the edges of the side-frames, which permit the insertion and removal of the spindles of the spools when the arms 21 and 22 are depressed, and confine them when in place. At their opposite ends the squared portions 15^a of the spools are received in the correspondingly shaped sockets of chucks 25, 26, 27 and 28 carried by rotary parts journaled in the side-frames 5 and 7, more particularly hereinafter described, and through which the rotating movements of the spools are effected or controlled. This duplicate construction of the several spools renders them bodily interchangeable relatively to their bearings; while the duplicate squared and rounded construction at the ends of each spool renders the latter interchangeable end for end, so that either end may engage the journal bearing and the other the chuck. This is important, since, when either duplicating band has been wholly wound up on the receiving spool, the two spools of that band may be withdrawn

and reversed as to their respective bearings, the delivery spool then becoming the receiving spool, and vice versa.

The receiving spool 15 of the item-duplicating band is normally maintained under winding tension by the following mechanism. Referring more particularly to Figs. 6 and 8, 29 designates a lateral pocket formed in the side-frame member 5, in the outer wall of which and in a bracket 30 secured to and extending inwardly of said wall is journaled a shaft 31. Loosely mounted on shaft 31 within the pocket 29 is a circular spring case 32 containing a helical spring 33, the inner end of which is secured at 34 to the shaft 31, while its outer end is secured at 35 to the rim of the case 32. Secured to one face of the case 32 is a spur gear 36, the hub 37 of which is loose on the shaft 31. Gear 36 meshes with and drives an idler gear 38 journaled in the side-frame member 5, and said gear 38 in turn meshes with and drives a gear 39 that is rigid with the spool chuck 26, this latter being journaled in a depending hanger 26ª secured to the side-frame member 5, and further being provided with a ratchet disk 40 engaged by a spring-pressed dog 41 which prevents back turning of the chuck and spool. The idler gear 38 is provided with a series of holes 42 adapted to be engaged by a pivoted spring-pressed locking dog 43, the tail of which lies adjacent to and slightly inwardly of the chuck 26, so that, when the spool is inserted in the chuck the dog 43 is retracted and the spring power is transmitted to the chuck, while, when the spool is withdrawn the dog 43 instantly snaps into one of the holes 42 and thus locks the spring against unwinding.

The receiving spool 17 of the caption duplicating band is normally maintained under winding tension through the chuck 27 by means of a helical spring 44 (Fig. 7), which latter is contained in a circular case 45 located within a lateral pocket 46 in the side-frame member 7. The outer end of said spring is secured at 47 to the rim of the case 45 and its inner end is secured at 48 to a shaft 49 journaled at one end in the wall of the pocket 46 and at its opposite end in an upstanding bracket 50 secured to the side-frame member 7. The spring case 45 is loose on the shaft 49, and secured to one face thereof and also loose on the shaft 49 is a spur gear 51 which meshes with and drives a spur gear 52 (Fig. 6) rigid with the chuck 27, which latter is rotatably mounted in an upstanding bracket 27ª secured to the side-frame member 7, and is also provided with a ratchet disk 53 engaged by a spring-pressed dog 54 for preventing back turning of the chuck. The chuck 27 is automatically locked against turning under the impulse of the spring 44 when the spool is not in place by means of a pivoted dog 55, the inwardly bent nose of which is adapted to engage one of a series of holes 56 formed in the ratchet disk 53, the dog 55 being normally pressed into such engagement by a leaf spring 57. The dog is automatically retracted upon the insertion of the spindle of the spool in the chuck 27 by means of a bent lever 58 pivoted between its ends to the bracket 27ª, its upper end underlying the dog 55 and its opposite end extending into the vicinity of and slightly in front of the chuck 27 so that, upon the insertion of the spindle in the chuck, the head of the spool strikes said lever and retracts the dog 55, thus leaving the spring 44 free to exert its winding tension upon the chuck 27. The spring 44 is wound up from time to time by a handle 59 fast on the shaft 48; while back turning of the shaft 49 under the expansive effect of the spring is checked by a ratchet disk 60 fast on shaft 49 and engaged by a spring-pressed dog 61.

The tensioning spring 33 of the receiving spool 15 of the item-duplicating band is wound up by the manual retraction of the gripper and automatic travel-limiting device of the item-duplicating band when said gripper is moved backwardly relatively to the band for a new engagement with the latter. These last-mentioned features will next be described, and the friction drive therefrom to the shaft 31 on which the spring 33 is wound will then be set forth.

Referring more particularly to Figs. 4, 5, 6 and 9, 62 designates a guide-strip secured to the inner face of the side-frame member 5 along its upper edge, between which strip and the opposed inner wall of the frame-member 5 is formed an undercut guide channel for the depending integral rack-bar 63 of the gripper-carrying bar 64, this latter resting slidably upon the upper edge of the side-frame member 5 and adapted, in its forward movement, to override the upper edge of the longitudinally alined side-frame member 7 of the other section of the machine, as shown in Fig. 6. The bar 64 performs several functions, chief of which are to carry the gripper or clamping device of the item-duplicating band and to furnish a support or carrier for a row of stop pins to assist in the measurement of the successive movements of the item-duplicating band and in the automatic arrest of the latter at the termination of each movement.

Referring first to the gripper, the construction and operation of which is most clearly shown in Figs. 8, 13 and 14, 65 designates a metal strip extending between the opposite side-frame members, the main intermediate portion of said strip lying beneath the bed 19, and the upwardly offset end portions 65ª and 65ᵇ (Fig. 13) lying substantially flush with and opposite the longitudinal edges of the bed 19. The end 65ª slidingly rests upon an inwardly ex-

tending ledge or shoulder 66 of the side-frame member 6, while the opposite end 65ᵇ has integral therewith or secured thereto an extension 67 overlying and rigidly secured to the top of the bar 64. The upwardly offset end portions 65ᵃ and 65ᵇ of the strip 65 constitute stationary clamp-members for engaging the longitudinal edges of the item-duplicating band 13, as shown in Fig. 12, and pivoted to the ends of the stationary clamp-members 65ᵃ and 65ᵇ on hinge pintles 68 and 69 are movable clamp-jaws 70 and 71, respectively. Rigid with the clamp-jaw 70 is an operating handle 72. The two movable jaws are connected so as to be opened in unison by the depression of the handle 72 through the agency of depending lugs 73 and 74 on the under sides of the clamp-jaws 70 and 71 and projecting through slots 75 and 76 in the stationary clamp-jaws, and links 77 and 78 pivoted to said lugs 73 and 74 and to the opposite ends of an intermediate lever 79, which latter is centrally pivoted at 80 to the under side of the strip 65. Tension springs 81 and 82 connected to the links 77 and 78, respectively, and at their other ends anchored to the under side of the strip 65 normally operate in opposition to the depression of the handle 72 and maintain the movable jaws 70 and 71 closed on the edges of the band. The outer edge of the bar 64 is, throughout the greater portion of its length, provided with a series of closely disposed vertical holes 83 extending therethrough, best shown in the detail views Figs. 9 and 10, in each of which holes is slidably mounted a pin 84 of a length somewhat exceeding the length of the hole, and each of said pins is given a limited vertical sliding capacity so as to project either above or below the bar 64 by means of a spring-pressed key 85 slidably mounted in a horizontal socket in the bar 64 and engaging a groove 86 in the pin 84. The key 85 serves to both limit the extent of movement of the pin 84 and to hold it frictionally in position when raised. Depending from the bar 64 just inwardly of the row of holes 83 and just outside the upper edge of the frame-member 5 is a comb-shaped member 87, the teeth of which constitute guides for a pin-raising device next to be described.

Mounted in brackets 88 (Figs. 2 and 3) on the side-frame member 5 alongside the bar 64 is a rod 89 that constitutes a support for a carrier 90 that is slidably mounted thereon. This carrier, as best shown in Figs. 2, 3 and 8, is a substantially hollow casting having sliding bearings at 90ᵃ and 90ᵇ on the rod 89, and an upper portion 90ᶜ overlying the bar 64, the inner depending side of which rests slidingly upon said bar and has secured thereto a bent sheet metal strip 91 (Fig. 8) having an inwardly bent end 91ᵃ engaging a horizontal guide-groove 64ᵃ in the inner side of the bar 64, whereby the carrier 90 is maintained in sliding engagement with the bar 64 and prevented from rocking on the rod 89. Within the depending portion of the carrier 90 and confined between the bearings 90ᵃ and 90ᵇ is a hub 92 rigid with which is an inwardly projecting arm 93 having a tapered tip 94 and an upwardly extending finger 95. Rigid with the hub 92 on the outer side thereof is an arm 96 that projects through a slot 97 in the depending portion of the carrier 90 and carries a button 98, by the depression of which the finger 95 is moved upwardly so as to raise one of the stops-pins 84 from its normal position in which it projects below the bar 64 to its raised or stop position in which it projects thereabove. The finger 95 is guided into engagement with the lower end of the pin by the engagement of the tip 94 between two adjacent teeth of the guide 87. A leaf spring 99 is secured to the carrier casting and at its free end underlying the arm 96 returns the latter to raised position when free, thus normally maintaining the finger 95 out of engagement with the pins 84. The carrier 90 is also equipped with means for manually returning the raised pins to lowered position and with means for arresting the backward travel of the carrier under the influence of a spring-retracted device hereinafter described. The pin-depressing device consists simply of a bolt 100 slidably mounted in the upper portion 90ᶜ of the carrier, said bolt having on its lower end a head 101 of sufficient diameter to engage two adjacent pins and on its upper end a button 102 for depressing the bolt, the latter being normally maintained in elevated position by a spring 103 between the top of the carrier and the lower side of the button 102. The carrier 90 and, of course, the pin-raising mechanism which is housed therein, is normally urged in a backward direction relatively to the bar 64 by means of a tape 104 (Fig. 2) that is attached at 105 to the rear end of the carrier 90 and at its other end is wound around a spring-actuated drum 104ᵃ (Fig. 2) in a circular casing 106 secured to the bar 64 at or near its rear end. The carrier 90 is restrained against this backward pull by means of a pivoted stop pawl 107 that is mounted in the carrier 90 and has a transversely bent end 108 that abuts against any one of the series of pins 84 that may have been raised to stop position as clearly shown in Figs. 2 and 11; the pawl being normally urged to "stop" position by a spring 109. The pawl 107 has at its forward end an inclined face 110 that, each time the carrier 90 reaches the forward limit of its travel, engages a fixed horizontal pin 111 (Fig. 3) that projects inwardly from the upper end

of a bracket 112 secured to the side-frame member 5; whereby the carrier 90 is released from engagement with the foremost of the series of raised stop-pins and is automatically drawn back by the tape 104 until the pawl 107 engages the next of the series of raised stop-pins and arrests the carrier thereat.

The bar 64 is normally urged forwardly or in the direction of the caption end of the machine by a helical spring 113 (Fig. 8) secured at one end to the side-frame 5, as shown at 114, and at its other end at 115 to the hub 116 of a spur gear 117 mounted preferably by anti-friction balls as shown, on a shaft 118 secured in the frame members 5, said gear 117 directly engaging the rack 63 of the bar 64. The spring 113 is re-tensioned by the manual retraction of the bar 64 by the operator when retracting the band clamp for a fresh grip upon the band. In this connection I will describe the means whereby the same manual retraction of the bar 64 maintains the spring 33 of the receiving spool of the band under tension. Still referring to Fig. 8, on the shaft 118 is a friction disk 119 engaging one face of the spur gear 117, fast with which friction disk is a ratchet disk 120 engaged by a pawl 121 mounted on the adjacent face of a spur gear 122, this latter also being rotatably mounted on the shaft 118. The gear 122 meshes with and drives a gear 123 fast on the shaft 31, and a ratchet disk 124 engaged by a pawl 125 (Fig. 5) prevents unwinding of the spring through back turning of the shaft 31. From this it is evident that the rotation of the spur gear 117 under the return travel of the rack 63 through the connections described winds up the spring 33 to the extent permitted by the friction disk 119, which latter is capable of adjustment by means of nuts 126 and washer 127 on the inner end of shaft 118. To prevent undue friction, anti-friction balls are employed between the hubs of the several rotary members on shaft 118 and the frame 5 and washer 127, as shown at 128, 129 and 130.

The bar 64, when retracted to its extreme limit, is automatically arrested in that position by means of the engagement of the foremost of the row of pins carried by the bar 64. Said pin, designated by 84ª is, unlike the others, normally spring-pressed to the upwardly projected position, and the under side of the upper end of the bracket 112, which projects inwardly over the upper side of the bar 64 is beveled or inclined on its under surface, as shown at 112ª in Fig. 1, so that said pin 84ª is depressed by sliding contact with the inclined under side of said bracket and, when it has passed the latter, springs up into stop engagement with the inner end of said overhanging portion of the bracket. Said pin is depressed so as to release the bar 64 when the item apron is to be advanced, by manual depression of a lever 131 (Figs. 1, 2 and 3) that is pivoted at 132 to the outer face of the bracket 112 and has an inwardly and transversely extending finger 133 overlying the row of pins in the bar 64, the lever 131 and finger 133 being normally raised against a stop projection 134 carried by the bracket 112 by a spring 135 (Fig. 2). When the bar 64 is fully retracted, the depression of the lever 131 forces downwardly the foremost spring-actuated stop-pin 84ª, allowing the bar 64 and the gripper carried thereby to move forwardly, thus advancing the item-duplicating band relatively to the receiving spool until the next of the series of raised pins in the bar 64 engages the overhanging end of the bracket 112 constituting a fixed stop.

In order to prevent further step-by-step advance travel of the item-duplicating band after the band has advanced to a point where the impression of the last item or group of items has passed down out of the printing field, and the machine is ready to be re-primed for a new impression from another master-sheet, I provide a device which interlocks with the depending lower ends of the pins 84 and, through the carrier 90, finds an abutment against the fixed bracket 112. This device is designed to be set in interlocked relation to that one of the row of pins which lies opposite the point on the item-duplicating band just below the last item or group of items thereon, and, as herein shown, consists of the following parts: 136 designates a slide that, by a hub or sleeve 137, is slidably mounted on the guide-rod 89 and operates over the outer vertical face of the bar 64, having inwardly projecting guide flanges 138 maintaining its engagement therewith. To this slide is pivoted at 139 by a friction joint a longitudinally extending latch-member 140. This latch-member has an inwardly extending lateral finger 141 lying directly below the pins 84, and it also has formed in its lower edge a notch 142, its forward end being rounded or curved from the forward edge of said notch up to the tip of the latch, as shown at 143 in Fig. 2. The carrier 90 has a laterally projecting index pointer 144, best shown in the detail view Fig. 8, that overlies a table 145 detachably mounted on the side-frame member 5 of the machine, on which table the master-sheet to be copied is laid. When the carrier 90 is retracted and positioned with the index pointer 144 just below the last item or group of items on the master-sheet, the arm 93 of the pin-elevating device slides under the cam-shaped end of the latch 140 and interhooks with the notch 142 thereof. The subsequent depression of the arm 96, not only raises one of the pins 84 by means of the finger 95, but

also raises the latch 140, causing the finger 141 thereof to raise the next pin 84 in rear of that raised by the finger 95, so that said finger 141 interhooks, as it were, with the next depending pin 84 in rear thereof, so that, with the latch 140 in the said position, the bar 64 cannot advance farther without carrying the latch 140 and its supporting slide 136 with it. If, in priming the machine, the slide 136 is at the extreme rear or left hand end of the machine, the carrier 90 is moved backwardly until the arm 93 interhooks with the notch 142 of the latch, whereupon both may be drawn forwardly until the pointer indicates the position at which the first of the row of stop-pins is to be set up. This raising of the latch 140 into interengaging relation with the pins of the bar 64 allows the arm 93 to drop out of engagement therewith when the pressure on the arm 96 is released, and consequently the carrier 90 advances alone to the several other positions at which its pointer 144 lies opposite the spaces between successive items or groups of items on the master-sheet.

Passing now to a consideration of the means for controlling the caption-duplicating band 14, 146 designates as an entirety a gripper which is a duplicate of the gripper already described for controlling the item-duplicating band and has a similar laterally projecting handle 147 by which it is opened for the purpose of a fresh adjustment upon the band. The handle end of this gripper, however, slidably engages a horizontally slotted guide 148 that may be suitably graduated in inches or other measurements, as indicated in Fig. 3, its extent of bodily travel being determined by the inner end of the slot of the guide 148 and a stop shoulder 149 (Fig. 2) formed on the end of an adjustable gage-bar 150, which latter is slidably confined between the vertically depending portion of the slotted guide 148 which secures the latter to the frame-member 7 and a horizontally slotted scale-bar 151 also secured to the side-frame member 7. The inner end or shank of the bar 150 carries a screw-threaded clamp 152 the stem or shank of which slidably engages the slot 151ª of the scale-bar 151, the latter being graduated, as indicated, corresponding to the graduations of the slotted guide 148. By setting the clamp 152 at any one of the graduated positions indicated on the scale 151, the stop 149 is so positioned as to permit a to-and-fro movement of the band gripper 146 to an extent corresponding to the indicated adjustment on the scale 151. This graduated adjustment is preferably provided, so as to insure an advance travel of the caption duplicating band to an extent corresponding with varying heights of captions to be transferred thereto. For instance, if a caption of one inch height or depth is to be transferred to the band, the gripper will be set for a one-inch travel so that, when the band is advanced to carry the impression of the one-inch caption out of the printing field, the advance movement will be limited to an extent just sufficient to so carry the one-inch caption out of the printing field and no more, thus utilizing the entire band for printing purposes and avoiding waste of space between successive captions.

Inasmuch as the receiving spools of both bands are normally under winding tension at all times when said spools are in operative position in the machine, it is necessary, when the band-gripping devices are released in order to be retracted to a fresh hold upon the band, to provide means for preventing the winding up of the bands during those times when the latter are not restrained against the pull of the winding spools by the grippers. The means for thus controlling the receiving spool of the item-duplicating band consists of the following. Referring to Figs. 4, 6 and 13, 153 designates a ratchet disk fast with the chuck 25 of the delivery spool of the item-duplicating band, and 154 designates a pivoted detent coöperating therewith. This detent is impelled into engaging relation to the ratchet disk by a spring 155, but is normally prevented from such engagement by a depending outwardly turned finger 156 overlying the tail of the detent carried by a bar 157 that is supported by laterally offset pivots 158 carried by inwardly projecting brackets 159 on the frame-member 5, so that said bar normally tends to tip or rock on its pivots in a direction to raise the finger 156 out of engagement with the detent pawl 154. When the clamps of the gripper are closed on the belt, as shown in Fig. 13, this bar 157 is maintained in an upright position, in which the finger 156 retracts the pawl 154 from its ratchet by means of a depending finger 160 secured to the under side of the link 77 of the gripper and slidingly engaging the inner face of the bar 157. The instant the clamps of the gripper are opened the finger 160 is retracted, allowing the bar 157 to rock on its pivots and the finger 156 to rise out of engagement with the pawl 154, whereupon the latter instantly snaps into engagement with the ratchet disk 153 and thus prevents the receiving spool from drawing the band off the delivery spool. A duplicate of this mechanism is employed for the control of the delivery spool of the caption-duplicating band at the opposite end of the machine, the parts of said mechanism being identified by the same numerals with an alphabetical exponent.

It is desirable, in order to prevent mistakes in using the machine, and in order to insure the "clearing" of the caption-dupli-

eating band, as well as of the item-duplicating band, when the machine is re-primed for a new master-sheet, to so interlock the gripping devices of the two bands that the gripping device of the item-duplicating band cannot ordinarily be re-set to a fresh position on the band without having first manipulated the gripping device of the caption-duplicating band. In the present machine I have provided a mechanism of this character, which will now be described.

Referring principally to Figs. 6 and 12, 161 designates a pawl pivotally mounted at 162 on the inner wall of the frame-member 7, said pawl having an upwardly extending nose engaging the teeth of the rack-bar 63 in a manner to permit forward movement of the rack-bar but locking the same against return movement until the pawl has been thrown out of action. This pawl is provided with a depending toe 163 which, as best shown in the detail view Fig. 12, has two differently inclined faces 163^a and 163^b. A leaf-spring 164 has an angularly bent free end presenting two oppositely inclined faces 164^a and 164^b, the former of which engages the face 163^a of the toe of the pawl when the latter is engaged with the rack-bar and holds it in such engagement, while the face 164^b engages the face 163^b of the pawl when the latter is out of engagement with the rack-bar and holds it disengaged from the latter. The pawl 161 is in engagement with the rack-bar during the forward travel of the latter; and, consequently, before the rack-bar, and the gripper of the item-duplicating band attached thereto, can be returned to initial position, it is necessary to disengage the pawl from the rack-bar. This is done through mechanism connected to and operated by the gripper of the caption-duplicating band.

Referring to Fig. 6, 165 designates a lever pivoted at 166 to the side-frame member 7, one end of said lever being forked as shown at 166^a, and engaging an outwardly turned finger 167 carried by the strip 157^a which, as above described, is under the control of the gripper of the caption-duplicating band and controls the pawl 154^a of the delivery spool of the latter. The opposite end of the lever 165 overlies a lateral pin 168 on the pawl 161. When the rack-bar has reached the limit of its advance or forward travel and it is necessary to return the same and the gripper of the item-duplicating band to initial position for a new hold on the latter, the depression of the handle of the caption-duplicating band permits the pivoted strip 157^a to rock, thus, through the rise of the finger 167, rocking the lever 165 and, through the pin 168, depressing the pawl 161 out of engagement with the rack-bar. This causes the free end of the spring 164 to snap into engagement with the other face 163^b of the toe of the pawl, as shown in Fig. 12, thus holding the latter disengaged and permitting the free return of the rack-bar. This release of the pawl from the rack-bar takes place while the operator is manipulating the gripper of the caption-duplicating band to set it to a fresh position on the latter, so that the manipulation of the caption-duplicating band to insure a fresh surface of the latter for the next impression is insured before the item-duplicating band can be primed to receive the next impression. The pawl 161 is automatically thrown back into rack-engaging position upon the complete return or retraction of the rack-bar by means of the engagement of a finger 169 mounted on the forward end of the rack-bar inwardly of the inner side of the latter with the free end of a spring 170 secured to the hub of the pawl, the free end of said spring projecting into the path of said finger and, when struck by the latter, throwing the toe of the pawl back from the position shown in Fig. 12 to the position shown in Fig. 6 in which the pawl engages the rack-bar for the next operation. To insure the rocking of the pivoted strip 157^a in a direction to raise the fingers 167 and 167, the gripper 146 of the caption-duplicating band may be provided with a depending finger 160^b on the opposite side of the strip 157^a from the finger 160^a, the finger 160^b insuring the downward rocking movement of said strip, while the finger 160^a effects the return of said strip to upright position (Fig. 7).

It may sometimes happen that the number of items or groups of items to be printed under a single caption may be greater than can be accommodated by a single working surface of the item-duplicating band, so that it may be necessary to manipulate the item-duplicating band several times in succession to obtain the requisite printing space for all the items under a single caption. In order, therefore, to be able to so manipulate the item-duplicating band without having to manipulate the gripper of the caption-duplicating band preliminary to each retraction of the gripper of the item-duplicating band, I provide a manually operable device for temporarily locking the pawl 161 out of engagement with the rack-bar, irrespective of the travel of the latter; this device comprising a pin 239 (Fig. 6) carried by a slide 240 (Fig. 2), the latter being mounted in a slideway 241 formed in or on the side-frame member 7, said pin extending through a horizontal slot 242 in said side-frame member and adapted, by a knob 243, to be moved into and out of engagement with a notch 161^a formed in the lower edge of the pawl 161, the relation of the pin to said notch being such that, when the pin is moved toward the pawl, it engages the lower inclined edge of the notch, throwing the

pawl-down out of engagement with the rack and holding it so disengaged until manually released by the retraction of the pin 239.

The two longitudinal sections of the machine frame are secured together by a latch 171 (Fig. 6) pivoted at 172 to the side-frame member 5 and engaging a lug 173 on the bottom rail or shoe of the side-frame member 7.

In order to form a practically continuous bed for the two sections of the machine, I interpose between the individual beds of the sections a transversely extending bridge-bar 174 (Figs. 4 and 6) which is pivoted at 175 to the inner end of one side of the section carrying the item-duplicating band, permitting it to be swung upwardly, out of the way when the machine sections are to be separated.

An idler roll 176 (Fig. 6) journaled on the inner wall of the side-frame member 7 constitutes an antifriction support for the advancing end of the rack-bar as the machine is operated.

In lugs 177 and 178 (Figs. 1 and 3) formed on extensions of the stationary hinge-members of the grippers are slidably mounted spring-retracted locking bolts 179 and 180, respectively, the inner ends of which, when pressed inwardly, engage notches 181 and 182 formed in the gripper handles 72 and 147, whereby the clamps or jaws of the grippers may be locked open when desired.

The successive advance movements of the item-duplicating band, which result from both the spring tension on the receiving spool and the spring actuation of the gripper-carrying rack-bar, and the sudden arrest of the latter at the end of each successive movement by the stop devices described, produces a somewhat sudden or jerky movement of the band which tends to unwind from the delivery spool more of the band than is wound up on the receiving spool, thus producing slack in the band near the former. To neutralize this effect and maintain the printing surface of the band taut, I preferably employ the device shown in Fig. 6 consisting of an arm 183 pivoted at 184 to the inner wall of the side-frame member 5 and lying adjacent to the inner face of the ratchet-disk 153, said arm being normally impelled to swing in a downward direction by a spring 185. The free end of this arm carries a dog 186, the nose of which is kept in engagement with the toothed periphery of the ratchet-disk by a spring 188. The ratchet-disk 153, it will be remembered, is rigid with the chuck 25 of the delivery spool, and when the latter turns in a direction to unwind the band the arm 83 is raised; and as soon as the unwinding movement of the spool ceases, the return downward movement of the arm 183 under the impulse both of gravity and the spring 185, imparts a short winding up movement to the delivery spool which takes out any slack that may have occurred in the band itself. I also preferably apply to the chucks of the receiving spools of both bands a somewhat similar device which, however, is manually operated, when necessary, to render the bands perfectly taut and smooth out any wrinkles that may occur therein.

Referring to Figs. 2 and 6, 189 and 189ª indicate arms freely pivoted on the spindles of the chucks 26 and 27, respectively, the free adjacent ends of said arms having finger-pieces 190 and 190ª projecting laterally between the adjacent ends of the side-frame members 5 and 7. Said arms are normally upheld by springs 191 and 191ª and carry spring-pressed pawls 192 and 192ª engaging the ratchet-disks 40 and 53, respectively. In case the spring drive imparted to the chucks 26 and 27 of the winding spools is insufficient to render smooth and taut the printing surfaces of the bands, this can be effected manually by depression of either or both of the arms 189 189ª by the finger-pieces 190 and 190ª.

I will next describe the platen and its operating and adjunctive devices whereby pressure is imparted to the master and copy sheets when the same are laid on the printing surfaces of the duplicating bands. This device, generally described, comprises a hollow cylinder rotatably mounted in a suitable frame, which latter is slidably and pivotally mounted at one end on a supporting rod secured to one side of the machine opposite and parallel with one edge of the printing bed. Associated with the cylinder is a clamp with means for opening the same to receive the upper edge of the sheet and for closing the clamp on the sheet when the cylinder is set in initial position to roll over the printing surface of the duplicating bands. As the cylinder is thus advanced, a spring between the cylinder and its frame is tensioned so that, when the cylinder is raised from the duplicating band, it automatically rotates in the opposite direction, unwinding and delivering the sheet. Also associated with the cylinder are suitable guides for facilitating the entrance and delivery of the sheet and the smooth and accurate winding of the sheet on the cylinder. For a detail description of this mechanism, reference may be had to Figs. 1, 2, 3, 5, 15 and 16 of the drawings.

Referring first to Figs. 1 and 2, 193 designates a rod that is secured in an angle-bracket 194 attached to the upper rear corner of the side-frame member 6 as by a set-screw 195. This rod passes through and slidably engages a similar angle-bracket 196 attached to or near the forward upper corner of the side-frame member 6. Slidably mounted on the rod 193 by separated bear-

ings 197ª and 197ᵇ in a carriage 197. Secured in a socketed bearing in the upper end of the carriage 197 is a horizontal spindle 198 which extends across and above the bed of the machine. On this spindle is loosely mounted a bail 199, the intermediate horizonal portion of which is provided with a handle 200 whereby the bail may be rocked on said spindle. Loosely mounted on the spindle between the vertical arms of the bail is a hollow sheet metal cylinder 201, the cylindrical surface of which is, in practice, preferably covered with a canvas or other surfacing material 201ª. Said cylinder at one point in its circumference is provided with a longitudinal depression 201ᵇ, shown in Figs. 15 and 16, in which lies a clamp-bar 202, said clamp-bar having at its ends arms 203 pivoted at 204 to the end walls of the cylinder and normally impelled to clamp-closing position by springs 205. Loosely mounted on the spindle 198 between one end of the cylinder and the adjacent arm of the bail, is a spring case 206 containing a helical spring 207, one end of which is attached to said spring case, while the other end is secured to a pin 208 projecting eccentrically from the end wall of the cylinder. A laterally projecting lug 209 on the outer wall of the spring case abuts against the adjacent arm of the bail, the latter thus constituting a stop for one end of the spring, and the latter is so wound that, as the cylinder is rolled from the caption-recording end of the machine toward and over the item-recording end, the spring is wound up, so that, when the cylinder is raised angularly on the pivotal bearings 197ª and 197ᵇ of its carriage, and the bail is swung to one side to release a detent device, hereinafter described, the spring unrolls the sheet from the cylinder.

Rigid with the carriage 197 is a horizontal bar 210 extending across and above the bed of the machine and parallel with and in front of the cylinder relatively to its direction of working travel, which bar has at its opposite end a rearwardly and upwardly bent arm 211 (Fig. 2), the upper portion of which constitutes a bearing for that end of the spindle of the cylinder. This bar and its inwardly extending arm constitute supports for several accessory devices, the bar 210 itself supporting a guide-chute 212 which directs the entrance and discharge of the paper. The chute 212 has, as best shown in Figs. 15 and 16, a downwardly turned lip 213 that projects below the lower edge of the bar 210 and guides the edge of the paper sheet directly into the clamp 202 (See Fig. 15).

In order to open the clamp 202 to receive the upper margin of the sheet, one arm of the bail is provided with a laterally extending arm 214, to the end of which is pivoted a pawl 215, the nose of which is normally pressed toward the end of the cylinder by a spring 216, in which position it abuts against a pin 217 on the latter so that, when the bail is swung to the right as shown in Fig. 15, the cylinder is partially rotated in the same direction until outwardly projecting lugs 218 on the clamp-supporting arms 203 abut against inwardly extending stops 219 on the carriage 197 and arm 211 at the opposite end of the cylinder. The slight continued rotation of the cylinder permitted by the extensible character of the springs 205 separates the clamp-bar from its seat in the surface of the cylinder, as shown in Fig. 15, readily permitting the insertion of the edge of the sheet. The return swing of the bail to vertical position permits the automatic closing of the clamp by the springs 205. When the handle is in the vertical position, as in operating the cylinder over the bed of the machine, the pawl 215 is kept out of engagement with the pin 217 by the engagement of the tail of the pawl with an inclined surface 211ª on the arm 211, as clearly shown in Fig. 5.

For correctly positioning the platen cylinder at the start, I provide in connection with the graduated scale 151 a guide for the free end of the cylinder-supporting frame (constituted by the carriage 197, bar 210 and arm 211), said guide, as best shown in Figs. 2 and 3, consisting of an inwardly extending plate 220 that is integral or rigid with the gage-bar 150 and is supported on the upper edge of the scale 151. The plate 220 has on its inner edge an upstanding rest 221 adapted to support a laterally offset depending arm 222 (Fig. 3) on the arm 211; and said depending arm 222 carries a laterally offset lug 223 that, as the cylinder is moved off the rest 221, engages an upright post 224 integral with the plate 220 and drops through a vertical notch 225, out of engagement with the guide 220. Pivoted to the outer edge of the guide-plate 220 by a depending hinge bracket 226 is a horizontally extending gage-arm 227 having an upturned flange 228 in transverse alinement with one edge of the notch 225 which marks the tangent line of the platen cylinder in the initial position of the latter. The gage-arm 227 coöperates with the detachable table 145 on which the master-sheet is laid preliminary to its application to the duplicating bands, as hereinafter described. The platen cylinder having thus been correctly positioned on the caption-duplicating band, by pushing on the bail handle the cylinder is rolled over the printing bed toward the opposite end of the machine, the bail being prevented from swinging in the direction of movement by the contact of the arm 214 with the underlying portion of the cylinder frame, until the depending arm 222 strikes

an inwardly extending stop-lug 230 (Fig. 8) carried by the carrier 90, the position of the latter on the bar 64, accordingly, determining the extent of travel of the platen cylinder, and consequently the amount of copy taken off the item-duplicating band by the sheet carried by the platen. As the cylinder rolls in the forward movement of the platen, the spring 207 is wound up, and it is restrained from unwinding the cylinder, until released, by a pawl 231 pivoted in an extension of the arm 211 and coöperating with a ratchet-disk 232 fast on the cylinder head, said pawl being urged into engagement with the ratchet by a spring 233.

When the cylinder has been swung up on its supporting rod 193 out of engagement with the duplicating band, the bail is given a rearward swing, whereupon a cam-lug 234 thereon strikes the nose of the pawl 231, forcing it out of engagement with the ratchet 232, whereupon the cylinder is free to rotate backwardly and thereby unwind and discharge the printed sheet. The ratchet disk 232 has a smooth portion in its periphery, as shown, over which the nose of the pawl rides idly, when the bail is being operated to open the clamp in priming the platen cylinder. To insure the accurate winding and unwinding of the paper on the platen cylinder, the bail is provided with a substantially semi-circular sheath or guard 235 that overlies the rear half of the cylinder. When the bail is swung rearwardly at the conclusion of the printing operation so as to release the spring and cause the cylinder to unwind and deliver the printed copy, the angular swing of the bail which effects the release of the pawl 231 from the ratchet 232 is of such extent as to carry the lower edge of the guard 235 into overlapping relation to the lip 213 of the discharge chute 212, which facilitates and insures the correct discharge of short sheets, cards, or the like which, in the printing travel of the cylinder, may have been carried past the tangent point of the cylinder on the band. A pin 236 (Fig. 5) projecting from one end of the cylinder and engaging a coöperating stop lug 237 projecting inwardly from the adjacent arm of the bail, effects the proper positioning of the cylinder for the start when the bail is returned to vertical position after having been swung backwardly to permit the discharge of a printed sheet. A tensile spring 238 between the platen frame and one arm of the bail normally maintains the bail in vertical position.

In describing the operation of the machine we will assume that it is to be used to produce sectional order sheets for the several departments of a mail order house or department store. Assuming that an order for a miscellaneous lot of goods comes in, the order is first written out on a master-sheet such as is shown at A in Fig. 19. This master-sheet contains at its upper end a caption A′ on which is printed in copying ink the name and address of the person or firm from whom the order is received and, usually, the name of the house by which the order is received, together with any other suitable or appropriate data. Beneath the caption, on the suitably ruled and lined main body portion of the sheet designated by A^3 is printed in copying ink the several items of the order, together with the quantities and prices, which items are, as shown, arranged in groups under the several sales departments or divisions of the house, as, in the illustration given, under divisions K, Y, S, T and W. In the case of a mail order house, there will also preferably be printed opposite each item the catalogue number thereof. The gage-arm 227 is then set on the scale 151 opposite the position indicating the height of the caption, and secured in such position by the clamping nut 152. The platen cylinder having been moved to the initial or starting position above the caption end of the machine with the offset depending arm 222 of the platen frame supported on the rest 221, in which position the cylinder is held out of engagement with the band, the master-sheet is introduced into the grip of the clamp of the platen cylinder, and the latter is then rolled over the duplicating bands, transferring the impression of the caption to the inner portion of the caption-duplicating band, and the impression of the grouped items to the inner portion of the item-duplicating band, the raising of the platen cylinder and rearward swing of the handle unwinding and delivering the sheet from the cylinder in the manner already described. The master-sheet is then laid, face up, on the table 145, with its upper edge abutting against the stop-flange 228 of the gage-arm 227, in which position the several printed lines of both the caption and item-duplicating portion of the sheet lie in transverse alinement with the impressions thereof previously transmitted to the two duplicating bands. The carrier 90, with its pin-setter 93 interhooked with the latch-member 140, in the manner shown in Figs. 9 and 10, is then moved along its supporting bar 89 until the pointer 144 overlies a position on the lower end of the sheet just beneath the lowermost group of items indicated as pertaining to division W. The button 98 is then depressed, which raises the pin-setter 93 and also the free end of the latch-bar 140, thereby, through the pin-engaging fingers 95 and 141, raising two adjacent stop-pins 84, the arm 93 being guided in such movement by engagement of its beveled tip 94 with the teeth 87 of the comb-like guide lying below the stop-pins.

Upon the release of the button 98, the

spring 99 raises the latter and lowers the pin-setter out of engagement with the depending ends of the pins; but the latch-bar 140 remains in raised position with its finger 141 between the lower ends of the pins on either side of the two pins that have been raised; so that said latch-bar and its sliding carrier are thus interlocked with the bar 64 and constitute a stop to prevent any further rearward movement of the carrier 90, in the later operation of the machine, until released. The carrier 90, thus freed from engagement with the latch 140, is next moved successively to positions where its pointer overlies the spaces between the remaining groups of items on the master-sheet, the pin-setter being actuated to raise one of the pins at each of said positions. After the pin-setter has raised the last of the series of raised stop-pins (which will lie opposite the spaces between the first and second groups of items on the master-sheet), the carrier is automatically retained in said position against backward pull of its retracting tape 104 by the engagement of the bent end 108 of the pawl 107 with said pin, in the manner clearly indicated in Figs. 2 and 11.

The machine has now been primed for the striking off of sectional orders for the several divisions or departments. For this, a blank sectional order sheet, such as shown at B in Fig. 20, having a suitably ruled caption portion B' identical in size with the caption portion A', of the master-sheet, and an item portion B^2 ruled similarly to, but shorter than the item portion A^2 of the master-sheet, is inserted in the platen cylinder and the latter then rolled over the caption-duplicating band and the inner portion of the item-duplicating band containing the impression of the first group of items for division K. The travel of the platen cylinder is automatically arrested as soon as the platen has advanced far enough to effect the printing of the uppermost group of items on the sectional order sheet by the engagement of the foremost edge of the depending arm 222 of the platen frame with the stop-lug 230 of the carrier 90, in the manner shown in the plan view, Fig. 3. The platen is then raised, the handle thrown back to release the clamp, the printed sheet withdrawn, and the platen cylinder retracted to initial raised position to receive the next sectional order sheet. This having been done, the operator depresses the lever 131, which causes the finger 133 to depress the foremost stop-pin 84^a which, it will be recalled, is normally maintained in elevated position. This permits the rack-bar carrying the series of stop-pins, with the band-gripper, to move forward under the combined influence of the winding spring of the receiving spool and the actuating spring of the rack-bar; and the carrier 90, being in engagement with the foremost of the several manually raised stop-pins is, of course, also carried forwardly until the beveled nose 110 of its pawl 107 engages beneath the pin 111, which rocks said pawl, releasing its tail 108 from engagement with the raised pin 84, which latter pin then engages the foremost edge of the upper end of bracket 112, thereby arresting further travel of the rack-bar and band, and simultaneously carrier 90, being released from the foremost pin, is drawn back by its tape 104 until the tail of its pawl strikes the next of the series of raised stop-pins, by which it is arrested. Another sectional sheet B is then applied to the platen, and the latter is manipulated as before, thus printing the order for division Y. The same operations are repeated until all of the separate orders for the several divisions or departments indicated on the master-sheet have been printed, it being understood that, of course, any desired or required number of copies of the complete master-sheet may be struck off, as also any desired or required number of copies of each sectional sheet.

As the carrier moves back into engagement with the first of the series of raised stop-pins which was originally opposite the space below the lowermost group of items on the master-sheet, its rear bearing 90^a comes in contact with the bearing 137 of the carrier or support of latch 140, so that, after the item-duplicating band has been permitted to advance to a position in which the impression of the last group of items has been carried below the printing plane, the engagement of the pawl 107 with pin 111 does not permit any further retraction of the carrier 90 by depression of the lever 131 or otherwise, and further forward movement of the item-duplicating band until the machine has been again primed is prevented by reason of the abutment of the forward bearing 90^b of the carrier 90 with the bracket 88 supporting the inner end of the rod 89.

In order to re-prime the machine for further use with another master order sheet, it is necessary, before the gripper of the item-duplicating band can be set back to a new engagement with the band, to first advance the previously used portion of the caption-duplicating band, which is done by depressing the clamp-handle 147, moving the gripper outwardly to the extent permitted by the stop 149, as shown in Fig. 2 (which corresponds in extent to the height of the caption of the sheet previously used), and then permitting the winding spring of the receiving spool to wind up the band to an extent which carries below the printing surface exactly the previously used portion of the caption-duplicating band, and no more. This manipulation of the clamp of the caption-duplicating band retracts the pawl 161

out of engagement with the rack-bar, throwing it to the position shown in Fig. 12, so that the rack-bar can then be retracted with the backward movement of the gripper of the item-duplicating band to fresh position, the finger 160 at the completion of said backward movement striking the spring 170 and thus re-setting the pawl 161 to rack-engaging position.

When either or both of the duplicating bands have been completely wound up on their receiving spools, by throwing up the bridge-bar 174, and throwing back the hook 171, the two sections of the machine may be separated, the spools taken out and simply reversed, by reason of the described adaptation of the duplicate ends of each spool to both the journal and chuck bearings thereof, the receiving spool then becoming the delivery spool, and vice versa, and this may be repeated until the duplicating bands are worn out or unfit for further use.

I claim:

1. In a multiple copying machine, the combination with a supporting frame, of a pair of duplicating bands mounted thereon, the working surfaces whereof are in longitudinal alinement, independently operable pairs of spools on which the idle portions of said bands are wound, means for tensioning said bands, and a platen operable over the working surfaces of both bands, substantially as described.

2. In a multiple copying machine, the combination with a supporting frame, of a pair of duplicating bands mounted thereon, the working surfaces whereof are in longitudinal alinement, independently operable pairs of spools on which the idle portions of said bands are wound, means for tensioning said bands, a platen cylinder, and means for guiding the latter in a rolling movement over the working surfaces of both bands, substantially as described.

3. In a multiple copying machine, the combination with a supporting frame made in two separable sections, of a pair of duplicating bands mounted on said sections, respectively, with their working surfaces in longitudinal alinement, receiving and delivery spools mounted in each of said frame sections whereon the idle portions of the bands are wound, means for tensioning the bands, and a platen operable over the working surfaces of both bands, substantially as described.

4. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a winding spring for said receiving spool, and means for automatically arresting the advance movement of said duplicating band at any of the series of predetermined positions, substantially as described.

5. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a winding spring for said receiving spool, means for automatically arresting the advance movement of said duplicating band at any of a series of predetermined positions, and manually operable means for successively releasing said band-arresting means, substantially as described.

6. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a continuously acting winding spring for said receiving spool, means for effecting successive advance movements of portions of the working surface of the band off said bed, and means for arresting the travel of the band at the end of each successive movement, substantially as described.

7. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, means for effecting successive advance movement of portions of the working surface of the band off said bed, means for determining the extent of each such advance movement, and means for automatically arresting the travel of the band at the end of each successive movement, substantially as described.

8. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a series of stop devices carried by said bar, means for setting any of said stop devices into operative position, a fixed stop coöperating successively with said operatively positioned stop devices whereby to arrest the successive advance movements of said bar, and means for moving said stop devices successively into inoperative position whereby to permit suc-

cessive advance movements of said bar, substantially as described.

9. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a series of stop devices carried by said bar, means for setting any of said stop devices into operative position, a fixed stop coöperating successively with said operatively positioned stop devices whereby to arrest the successive advance movements of said bar, means for moving said stop devices successively into inoperative position whereby to permit successive advance movements of said bar, and means for locking said bar against further advance movement when the last of said operatively positioned stop devices has engaged said fixed stop, substantially as described.

10. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a row of stop-pins mounted in said bar, the foremost whereof is normally maintained in operative position, manually operable means for setting any of the other of said stop-pins into operative position, a fixed stop coöperating successively with said operatively positioned stop-pins, and manually operable means for moving said stop-pins successively into inoperative position whereby to permit successive advance movements of said bar, substantially as described.

11. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivering spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a row of stop-pins mounted in said bar, the foremost whereof is normally maintained in operative position, a carrier mounted to travel over said bar and carrying a pointer and, in alinement with the latter, a device for setting any of the other of said stop-pins into operative position, a fixed stop coöperating successively with said operatively positioned stop-pins, and manually operable means for moving said stop-pins successively into inoperative position whereby to permit successive advance movements of said bar, substantially as described.

12. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a row of stop-pins mounted in said bar, the foremost whereof is normally maintained in operative position, a carrier mounted to travel over said bar, spring means tending to retract said carrier, an outwardly projecting pointer on said carrier, a pin-setter in alinement with said pointer and movable with said carrier, a pawl on said carrier automatically engaging said stop-pins when moved to operative position by said pin-setter, a fixed stop coöperating successively with said operatively positioned stop-pins, manually operable means for moving said stop-pins successively into inoperative position, whereby to permit successive advance movements of said bar, and means for automatically disengaging said pawl from said pins to permit retraction of said carrier at the termination of each forward movement of said bar, substantially as described.

13. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a row of stop-pins mounted in said bar, the foremost whereof is normally maintained in operative position, a carrier mounted to travel over said bar, spring means tending to retract said carrier, an outwardly projecting pointer on said carrier, a pin-setter in alinement with said pointer and movable with

said carrier, a pawl on said carrier automatically engaging said stop-pins when moved to operative position by said pin-setter, a fixed stop coöperating successively with said operatively positioned stop-pins, manually operable means for moving said stop-pins successively into inoperative position, whereby to permit successive advance movements of said bar, means for automatically disengaging said pawl from said pins to permit retraction of said carrier at the termination of each forward movement of said bar, and another manually operable device mounted on said carrier for returning said stop-pins to inoperative position, substantially as described.

14. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame whereon the idle portions of said band are wound, a spring exerting a winding tension on said receiving spool, a gripper adapted to clamp said band, a bar slidably mounted on said frame parallel with the band and carrying said gripper, spring means normally urging said bar in the direction of travel of the band, a row of stop-pins mounted in said bar, the foremost whereof is normally maintained in operative position, a manually operable pin-setter for moving any of the other of said stop-pins into operative position, a guide for directing said pin-setter into engagement with said stop-pins, a fixed stop coöperating successively with said operatively positioned stop-pins, and manually operable means for moving said stop-pins successively into inoperative position whereby to permit successive advance movements of said bar, substantially as described.

15. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted on said frame whereon the idle portions of said band are wound, a continuously acting winding spring for said receiving spool, a slidable gripper adapted to clamp said band, means for releasing said gripper from clamping engagement with said band and moving it to a new position of engagement therewith, and means controlled by said gripper-releasing means for arresting the unwinding movement of said delivery spool, substantially as described.

16. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted on said frame whereon the idle portions of said band are wound, a continuously acting winding spring for said receiving spool, a slidable gripper adapted to clamp said band, a handle whereby said gripper is released from clamping engagement with said band and moved to a new position of engagement therewith, a ratchet-disk rigid with said delivery spool, a detent coöperating with said ratchet-disk, and means controlled by said handle whereby the engagement of said detent with said ratchet-disk is effected simultaneously with the actuation of said handle to release said gripper, substantially as described.

17. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a chuck engaging the spindle of said receiving spool, a continuously acting winding spring for said chuck, and a detent for said chuck released by the spool when inserted in the chuck, substantially as described.

18. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, means for effecting an intermittent winding of said band on said receiving spool, and means for taking up slack in the band between said receiving and delivery spools, substantially as described.

19. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, means for effecting an intermittent winding of said band on said receiving spool, and means applied to the delivery spool for automatically taking up slack in the band between said receiving and delivery spools, substantially as described.

20. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, means for effecting an intermittent winding of said band on said receiving spool, means applied to the delivery spool for automatically taking up slack in the band resulting from excess movement of said delivery spool, and manually operable means applied to the receiving spool for smoothing and tightening the band on said bed, substantially as described.

21. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a gripper slidably mounted on said frame and engaging said band, a spring and connections therefrom to

said gripper for actuating the latter over said frame in the direction of the receiving spool, manually operable means for releasing and returning said gripper to starting position and, through said connections, re-tensioning said spring, a winding spring for said receiving spool, and tensioning means for said last-named spring actuated by said gripper-actuating connections on the return movement of said gripper, substantially as described.

22. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a gripper slidably mounted on said frame and engaging said band, a spring and connections therefrom to said gripper for actuating the latter over said frame in the direction of the receiving spool, means for automatically arresting the advance travel of said gripper at each of a series of predetermined positions, manually operable means for releasing and returning said gripper to starting position and, through said connections, re-tensioning said spring, a winding spring for said receiving spool, and tensioning means for said last-named spring actuated by said gripper-actuating connections on the return movement of said gripper, substantially as described.

23. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, and a gripper slidably mounted on said frame and provided with clamps adapted to engage the opposite edges of said band, substantially as described.

24. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a gripper slidably mounted on said frame and provided with clamps adapted to engage the opposite edges of said band, a handle on said gripper, and means actuated by said handle for opening said clamps, substantially as described.

25. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a gripper slidably mounted on said frame beneath said bed and provided with clamps adapted to engage the opposite edges of said band, spring-actuated connections between said clamps normally maintaining the latter closed on the band, a handle on said gripper, and means actuated by said handle for simultaneously opening said clamps, substantially as described.

26. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a gripper slidably mounted on said frame and engaging the margins of said band, an operating handle on said gripper, a gage mounted on said frame, and stop devices limiting the travel of said gripper to the amount indicated by said gage, substantially as described.

27. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools whereon the idle portions of said band are wound, a gripper slidably mounted on said frame and engaging the margins of said band, an operating handle on said gripper, and means determining the extent of travel of said gripper, the same comprising a fixed scale on said frame, a slidable gage-member on said scale, means for securing the latter at any fixed position on said scale, and a stop carried by said slidable gage-member adapted to engage said gripper at one extreme of its travel, substantially as described.

28. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band supported on said bed, a platen frame slidably mounted at one end adjacent to one edge of said duplicating band and overlying the latter, a platen cylinder rotatably mounted in said platen frame, and a platen-positioning device adjustably mounted adjacent to the opposite edge of said duplicating band and cooperating with said platen frame at its other end to determine the starting position of said platen cylinder relatively to the duplicating band, substantially as described.

29. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band supported on said bed, a platen frame hinged at one end to swing in a vertical plane and slidably mounted at said hinged end adjacent to one edge of said duplicating band and overlying the latter, a platen cylinder rotatably mounted in said platen frame, and a platen-positioning device adjustably mounted adjacent to the opposite edge of said duplicating band and cooperating with said platen frame to determine the starting position of said platen cylinder relatively to the duplicating band, substantially as described.

30. In a multiple copying machine, the combination with a frame carrying a bed, of a duplicating band having its working surface supported on said bed, receiving and delivery spools mounted in said frame where-

on the idle portions of said band are wound, a winding spring for said receiving spool, means for effecting successive advance movements of predetermined sections of said band over said bed, a platen movable over said band, a stop device for limiting the extent of travel of said platen, and means for automatically shifting said stop device successively to positions opposite the divisions between said predetermined sections of said band as the latter is advanced, substantially as described.

31. In a multiple copying machine, the combination with a supporting frame, of a pair of duplicating bands mounted thereon with their working surfaces in longitudinal alinement, band-controlling grippers slidably mounted on said frame and respectively engaging the margins of said bands, handles for said grippers through which the latter are released and retracted for fresh holes on said bands, means automatically locking one of said grippers against retraction, and means actuated by the handle of the other gripper for releasing said locking means, substantially as described.

32. In a multiple copying machine, the combination with a supporting frame, of a pair of duplicating bands mounted thereon with their working surfaces in longitudinal alinement, band-controlling grippers slidably mounted on said frame and respectively engaging the margins of said bands, handles for said grippers through which the latter are released and retracted for fresh holds on said bands, means automatically locking one of said grippers against retraction, means actuated by the handle of the other gripper for releasing said locking means, and means for automatically restoring said locking means to operative position upon the complete retraction of said first-named gripper, substantially as described.

33. In a multiple copying machine, the combination with a supporting frame, of a pair of duplicating bands mounted thereon with their working surfaces in longitudinal alinement, band-controlling grippers slidably mounted on said frame and respectively engaging the margins of said bands, handles for said grippers through which the latter are released and retracted for fresh holds on said bands, a slidable rack-bar rigid with one of said grippers, a spring-pressed pawl normally engaging said rack-bar in a manner to prevent its retraction, and means actuated by the handle of the other gripper for throwing said pawl out of engagement with said rack-bar, substantially as described.

34. In a multiple copying machine, the combination with a supporting frame, of a pair of duplicating bands mounted thereon with their working surfaces in longitudinal alinement, band-controlling grippers slidably mounted on said frame and respectively engaging the margins of said bands, handles for said grippers through which the latter are released and retracted for fresh holds on said bands, a slidable rack-bar rigid with one of said grippers, a spring-pressed pawl normally engaging said rack-bar in a manner to prevent its retraction, means actuated by the handle of the other gripper for throwing said pawl out of engagement with said rack-bar, and means for restoring said pawl to operative engagement with said rack-bar upon the complete retraction of the latter, substantially as described.

35. In a multiple copying machine, the combination with a supporting frame and a duplicating band mounted thereon, of a platen frame slidably mounted on said supporting frame above said duplicating band, a cylinder rotatably mounted in said platen frame, an operating handle for said cylinder, means for effecting the rolling of a copy sheet around said cylinder when the latter is in rolling engagement with said duplicating band, and spring means operating to rotate said cylinder in a backward direction when the latter is raised out of engagement with said duplicating band, whereby to discharge the printed copy sheet, substantially as described.

36. In a multiple copying machine, the combination with a supporting frame and a duplicating band mounted thereon, of a platen frame slidably mounted on said supporting frame above said duplicating band, a cylinder rotatably mounted in said platen frame, an operating handle for said cylinder, a spring-actuated clamp extending longitudinally of the surface of said cylinder, means for opening said clamp to admit the margin of a copy sheet thereto, spring means normally tending to rotate said cylinder in a backward direction to discharge the printed sheet, a ratchet fast with said cylinder, a pawl normally engaging the same to prevent backward rotation of said cylinder, and means for disengaging said pawl from said ratchet after the completion of the printing operation, substantially as described.

37. In a multiple copying machine, the combination with a supporting frame and a duplicating band mounted thereon, of a platen frame slidably mounted on said supporting frame above said duplicating band, a cylinder rotatably mounted in said platen frame, an operating handle including a bail pivotally mounted in said platen frame coincident with the axis of said cylinder and straddling the latter lengthwise, a spring-actuated clamp extending longitudinally of the surface of said cylinder, a tangential guide-chute mounted on said platen frame, and a curved guide secured to said bail and

partially surrounding the surface of said cylinder, substantially as described.

38. In a multiple copying machine, the combination with a frame formed in two separable sections disposed end to end, of duplicating bands mounted on and longitudinally of said frame-sections with their working surfaces in a common plane, and a bridge-bar lying between the inner adjacent ends of said duplicating bands with its upper surface substantially in the plane of the latter, substantially as described.

39. In a multiple copying machine, the combination with a frame formed in two separable sections disposed end to end, of duplicating bands mounted on and longitudinally of said frame-sections with their working surfaces in a common plane, and a bridge-bar pivoted at one end to the inner end of one of said frame-sections and adapted to bridge over the space between the inner adjacent ends of said duplicating bands, substantially as described.

40. In a multiple copying machine, the combination with a frame formed in two separable sections disposed end to end, of track rails rigid with one of said sections whereon said other frame-section is slidably mounted, duplicating bands mounted on and longitudinally of said frame-sections with their working surfaces in a common plane, and means for separably connecting the adjacent ends of said frames, substantially as described.

41. In a multiple copying machine, the combination with a frame formed in two separable sections disposed end to end, of duplicating bands mounted on and longitudinally of said frame-sections with their working surfaces in a common plane, a platen-supporting rod disposed longitudinally of and alongside said frame-sections, said rod being secured to one of said frame-sections and slidable relatively to the other, a platen-frame slidably and pivotally mounted on said rod, and a platen-cylinder rotatably mounted in said platen-frame above said duplicating bands, substantially as described.

42. In a multiple copying machine, the combination with a machine frame having on one side thereof a journal bearing and on the opposite side a chuck, of a duplicating band, and a spool on which said duplicating band is wound, said spool having at each end a squared chuck-engaging member and a cylindrical bearing member, whereby said spool is interchangeable end for end between said chuck and journal bearing, substantially as described.

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Witnesses:
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FREDERICK C. GOODWIN.

(Model.) 95&96

R. A. BENDALL.

Machine for making Three Ply Roofing Felt.

No. 237,158. Patented Feb. 1, 1881.

Fig. 1.

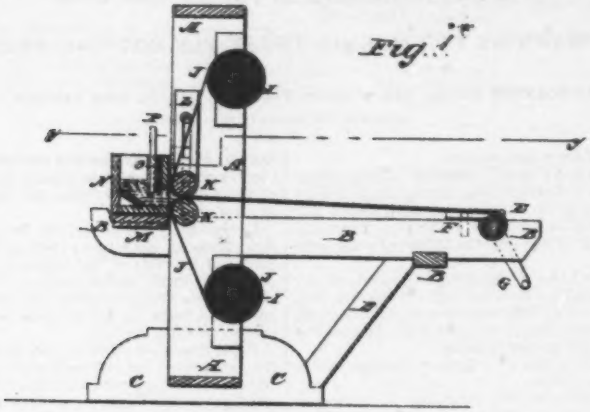


Fig. 2.

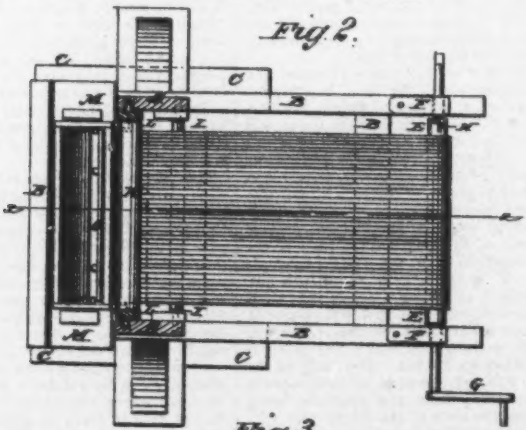
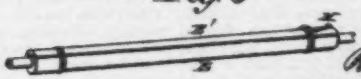


Fig. 3



WITNESSES:

F. M. Ambler

C. Sedgwick

INVENTOR:

R. A. Bendall

BY Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

ROBERT A. BENDALL, OF COHOES, NEW YORK.

MACHINE FOR MAKING THREE-PLY ROOFING-FELT.

SPECIFICATION forming part of Letters Patent No. 237,153, dated February 1, 1881.

Application filed December 6, 1880. (Model.)

To all whom it may concern:

Be it known that I, ROBERT ALBERT BENDALL, of Cohoes, Albany county, State of New York, have invented a new and useful Improvement in Machines for Making Three-Ply Roofing-Felt, of which the following is a specification.

Figure 1 is a sectional side elevation of my improvement, taken through the line *x x*, Fig. 2. Fig. 2 is a sectional plan view taken through the line *y y*, Fig. 1, and Fig. 3 is a perspective view of the receiving-roller.

Similar letters of reference indicate corresponding parts.

The object of this invention is to furnish machines for inserting a layer of plastic slate between two layers of paper, pressing the three plies or thicknesses into a compact felt, and winding the felt into a roll.

A represents a vertical frame, to which, at a suitable distance above the floor, is attached the rear part of a horizontal frame, B. The vertical frame A is attached at its lower end to a base or foot, C, of such a width as will give a firm support to the frames A B. The forward part of the horizontal frame B is strengthened in place by braces D attached to it and to the base C.

In the upper edge of the forward part of the side bars of the horizontal frame B are formed notches, in which revolve the journals of a roller, E, to receive the completed felt. The journals of the roller E are kept in their bearings by buttons F, pivoted to the frame B, and to one or both of said journals is attached a crank, G, by means of which the roller is turned to wind up the felt. The body of the roller E is made of two unequal parts tapered in opposite directions, the journals being formed upon the ends of the longer part.

To the larger end of the smaller part E′ of the roller E is attached a loop or other catch, H, so that when the roll of felt has been formed and removed from the machine the loop H can be caught upon or grasped by a hook or other suitable catch and the smaller part E′ of the roller E drawn out, which loosens the larger part of the said roller and allows it to be readily removed from the roll of felt. The roller E is then placed upon the machine to receive another roll of the felt.

In the forward edges of the side bars of the upright frame A are formed inclined slots to receive rods I, which are passed through rolls of the paper J, which forms the outer layers or plies of the felt.

In the rear parts of the side bars of the upright frame A are formed vertical slots to receive the journals of the rollers K, which are made sufficiently heavy to spread the layer of plastic slate evenly between the two layers of paper and press the three layers or plies together, forming the felt.

From the upper parts of the slots in which the journals of the rollers K work are formed cross-slots leading out to the rear edges of the side bars of the frame A, so that the rollers K can be readily removed and cleaned. The rollers K are kept in place by slides L, the lower ends of which rest upon the journals of the upper roller, K, and which are slotted longitudinally to receive the screws that secure them to the side bars of the frame A.

The rearwardly-projecting ends of the side bars of the frame B are notched to receive the board M, which serves as a table to support the tank N.

The plastic slate, which is formed of ground or pulverized slate and coal-tar in the ordinary manner, is placed in the tank N and escapes through a longitudinal opening in the lower part of the forward side of the said tank into the angle between the plies of paper J as they come together around the rollers K. The bottom of the tank N, or a false bottom placed within the said tank, inclines forward to cause the plastic slate to flow readily through the slot in the forward side of the said tank. The outflow of the plastic slate can be prevented, when desired, by a slide, O, placed against the inner surface of the forward side of the tank N, and kept in place by cleats attached to the ends of the said tank. The slide O is provided with handles P for convenience in inserting, adjusting, and removing said slide.

As heretofore practiced, a layer of tar-saturated paper is laid upon a roof. A layer of plastic slate is applied to it. Another layer of tar-saturated paper is placed upon the plastic slate, and a finishing-layer of plastic slate is then applied to the upper layer of paper. By my improvement all this work, except applying the last or finishing layer of plastic slate, is done in the manufactory, and

all that is necessary in covering a roof is to lay down the prepared roofing-felt and apply the finishing-layer of plastic slate.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the winding-roll E, the pressure-rolls K K, the rods I, and the tank N, the latter being provided with an inclined bottom and side slot at the lower end of said incline, as and for the purpose described.

2. The winding-roll E, formed of two unequal parts, the larger provided with both the journals and the smaller with a catch, H, as shown and described.

ROBERT ALBERT BENDALL.

Witnesses:

D. S. DODGE,

EZRA W. CARTER.

99&100

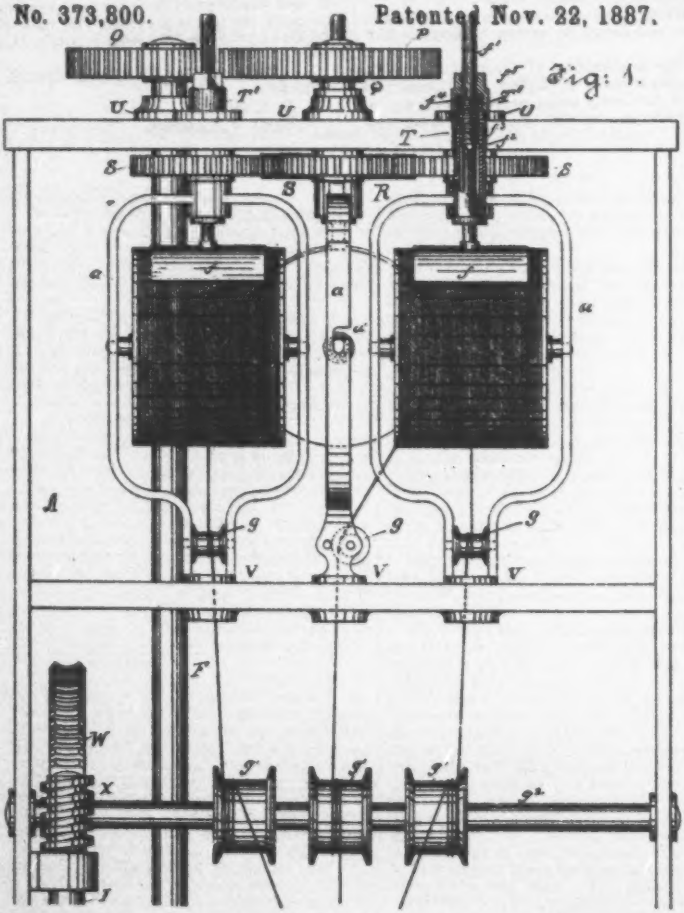
(No Model.) 5 Sheets—Sheet 1.

T. B. DOOLEY.

MACHINE FOR MAKING CORD AND ROPE.

No. 373,800. Patented Nov. 22, 1887.

Fig: 1.



Witnesses:
George Mesenger
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Inventor,
Thomas B. Dooley
Per; Wright, Brown & Quinby
his Attys.

101&102

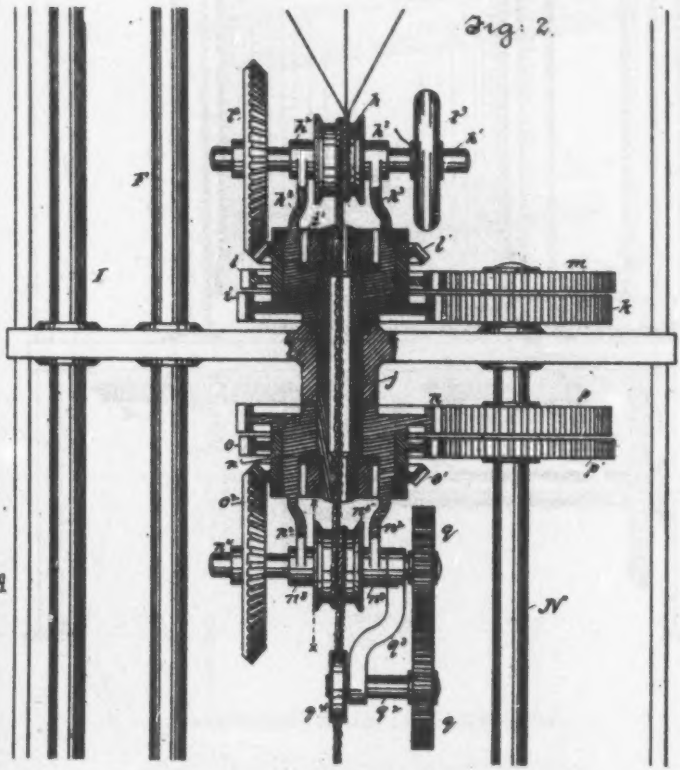
(No Model.) 5 Sheets—Sheet 2.

T. B. DOOLEY.

MACHINE FOR MAKING CORD AND ROPE.

No. 373,800. Patented Nov. 22, 1887.

Fig. 2.



Witnesses:
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(No Model.) 5 Sheets—Sheet 3.

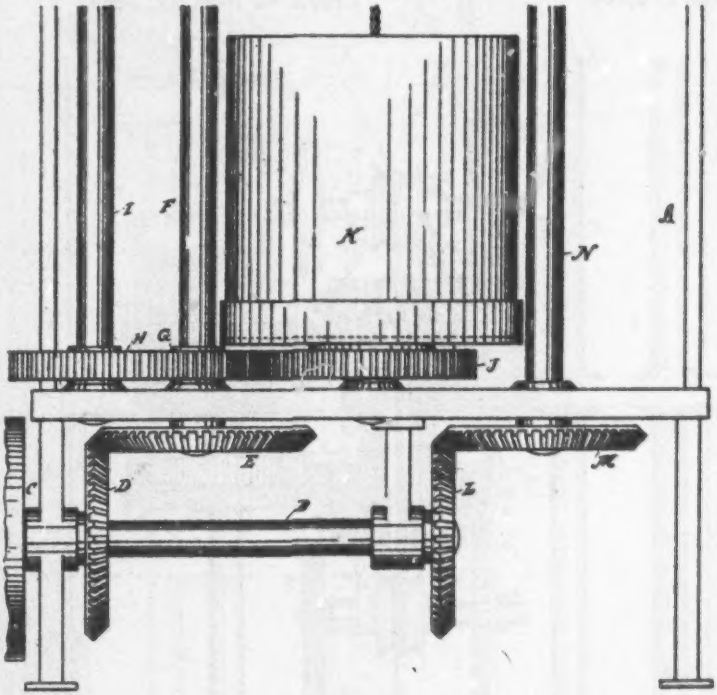
T. B. DOOLEY.

103&104

MACHINE FOR MAKING CORD AND ROPE.

No. 373,800. Patented Nov. 22, 1887.

Fig: 3.



Witnesses:
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John A. Regnier

Inventor:
Thomas B. Dooley.
By: Wright, Brown & Quinby.
his Attys.

(No Model.) 5 Sheets—Sheet 4.

T. B. DOOLEY.

MACHINE FOR MAKING CORD AND ROPE.

No. 373,800. Patented Nov. 22, 1887.

Fig: 4.

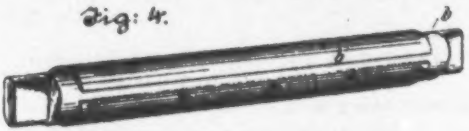


Fig: 5.

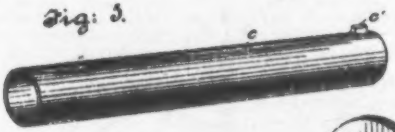


Fig: 6.

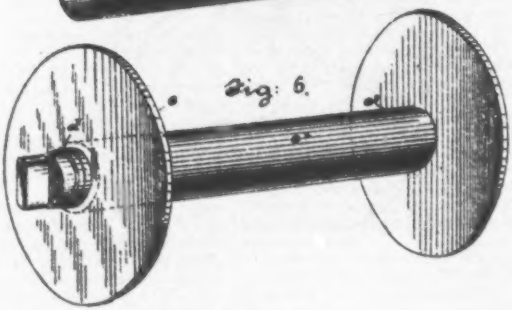
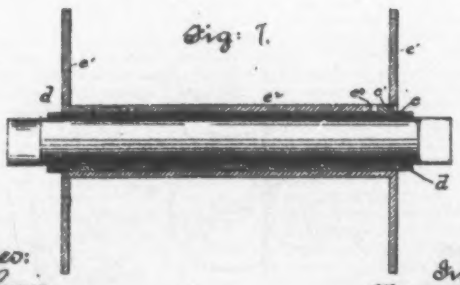


Fig: 7.



Witnesses:
John A. Rennie
Geo. Mellinger

Inventor
Thomas B. Dooley.
Per: Wright Brown & Quinby
his Attys.

107&108

(No Model.) 5 Sheets—Sheet 5.

T. B. DOOLEY.

MACHINE FOR MAKING CORD AND ROPE.

No. 373,800. Patented Nov. 22, 1887.

Fig: 8.

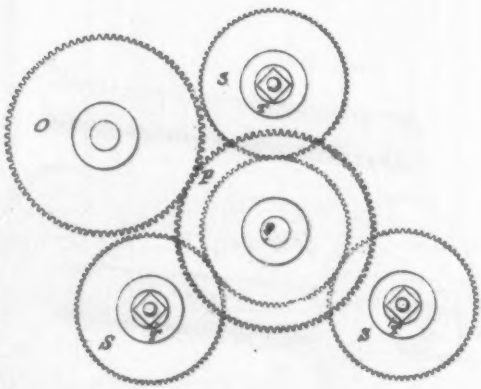
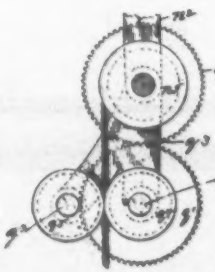


Fig: 9.



Witnesses:
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Geo. H. Mellinger

Inventor
Thomas B. Dooley.
Per: Wright, Brown & Quinby,
his Attys.

THOMAS B. DOOLEY, OF BOSTON, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NATIONAL LINE AND CORDAGE MACHINE COMPANY, OF PORTLAND, MAINE.

MACHINE FOR MAKING CORD AND ROPE.

SPECIFICATION forming part of Letters Patent No. 373,800, dated November 22, 1887.

Application filed April 19, 1886. Serial No. 199,411. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. DOOLEY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Machines for Making Cord and Rope, of which the following is a specification.

My invention relates to machines for making cords and ropes or cables, and has for its object to provide improved means whereby strands to form cords may be twisted together under uniform tension, and the cords may be in like manner laid up into the complete cord or rope, as well also to give a uniform twist to the cord or rope throughout its entire length, and to avoid the liability of the "kinking" of the completed cord or rope, as will be hereinafter described, and subsequently set forth in the claims.

In the drawings hereto annexed and forming a part of this specification, Figure 1 represents a side view, partially in section, of the upper portion of my improved rope-making machine. Fig. 2 is a like view of the central portion of the machine, and Fig. 3 a side view of the lower portion of the machine. Fig. 4 is a perspective view of one of the spool or bobbin shafts or spindles. Fig. 5 is a perspective view of a sleeve designed to be slipped upon the part represented in Fig. 4. Fig. 6 represents a spool and its immediately-associated parts; and Fig. 7 is a vertical longitudinal section of the parts represented in Fig. 6, the spool-shaft being in elevation. Fig. 8 is a diagrammatic plan view of the gearing for revolving the fliers. Fig. 9 is a sectional detail on the line *x x*, Fig. 2, hereinafter described and referred to.

Similar letters of reference indicate similar parts in all of the figures.

In carrying out my invention I provide a suitable frame, A, consisting of upright posts united by cross or tie beams in any common or known way, which frame is adapted to support the various parts or devices comprising my machine, the construction and operation of which I will now proceed to set forth.

B represents the main shaft, journaled at one end in bearings secured to the frame of the machine and at the other end in a bearing formed in a bracket or hanger depending from the lower tie or cross bar of the frame. On the outer end of the main shaft is a pulley, C, (a portion only of which is shown in Fig. 3,) designed to receive a belt driven by any prime motor.

Secured to shaft B, just inside of the point at which it is journaled in the frame, is a bevel-gear, D, which meshes with another bevel-gear, E, secured to the lower end of an upright shaft, F, termed by me the "flier-driving shaft," having suitable bearings in the cross-bars of the frame, as shown. Just above the lower support of shaft F, and secured to the latter, is a gear-wheel, G, meshing at one side or point with a gear-wheel, H, secured to the lower end of an upright shaft, I, also having suitable bearings and supports in the frame, and at the other side or at another point meshing with a gear-wheel, J, secured to the stud or journal of a coiling or receiving can, K.

At the end of main shaft B opposite to that at which pulley C is attached thereto is secured a bevel-wheel, L, meshing with a like wheel, M, secured to the lower end of another upright shaft, N, journaled and supported in the frame similar to shafts F and I. The flier-driving shaft F extends above the frame of the machine, and has secured to its upper end a gear-wheel, O, which meshes with another wheel, P, secured to and revolving with a short shaft, Q, supported and having its bearings in the top of the frame. To the lower end of said short shaft Q is secured a gear-wheel, R, which meshes at different points with gear-wheels S S S, secured to the upper spindles, T, of the fliers *a*. Said spindles T turn in suitable boxes or bushings, U, secured in the top of the frame. The fliers *a* are provided at their lower ends with journals or arbors adapted to turn and be supported in boxes or bushings V, set in a cross-bar or portions of the frame A. Fliers *a* are similar in form to devices of the same name employed in certain well-known types of spinning-frames, and have oblong, or it may be square, open notches formed in their sides, as represented at *a'*, to receive the correspondingly-shaped ends of the spool-shafts *b*, this construction being for

the purpose of preventing the spool-shafts from turning in the sides of the fliers. Each spool-shaft *b* is provided with a split sleeve, *b'*, one edge of which is secured to the shaft, while the other edge, (which is free,) when the sleeve is in its normal position, will spring away therefrom, so that the sleeve will nearly surround the shaft without touching it excepting on the line where it is secured thereto, all as clearly represented in Fig. 4 of the drawings. A sleeve, *c*, as represented in Fig. 5, is provided, having a diameter adapting it to fit snugly on split sleeve *b'* when the edges of the latter sleeve are pressed together, and when in this position said split sleeve will in turn fit rather snugly around a spool-shaft *b*, and at the same time exert considerable friction on the interior of the sleeve *c*, so that it will require some force to turn the latter sleeve on the former. A collar, *d*, of sufficient depth or thickness to bring its periphery flush with the outer surface of sleeve *c*, is shrunk upon or otherwise secured to each end of spool-shaft *b*, adjacent to the ends of the sleeves *b' c*, when the latter are in position on the shaft to prevent their accidental removal.

e represents a spool provided with the usual disks or sides, *e'*, of any suitable size, and having a hollow barrel, *e''*, adapted to fit snugly over sleeve *c*, which latter device is provided at one end with a spline or stud, *c'*, constructed to fit a groove, *c''*, formed in one end of the spool-barrel *e''*, as is clearly shown in Figs. 6 and 7. With this construction of the spool and its adjuncts and with the parts in operative position, which is the position in which they are represented in Figs. 6 and 7, it will be seen that the spool cannot be turned independently of its shaft without turning with sleeve *c*, and the turning of the latter being, as has been stated, in some degree resisted by the friction of split sleeve *b'*, the turning of the spool on its shaft will of course be likewise resisted.

In the operation of forming a rope by my machine it is designed that each spool shall be supplied with any desired number of strands of twine simultaneously wound thereon, and the construction of the spool with respect to its shaft, and the manner of sustaining the latter in its flier, as described, is for the purpose of placing the strands under some tension in drawing them off from the spool, though the tension thus necessarily exerted on the strands is not sufficient to properly form cords for a rope. It may also be remarked in this connection that as the strands are always drawn off in the same direction and to the same point whether the spools be full or nearly empty, if no other provision were made than such as has been explained, the tension on the strands would vary in accordance with the amount of twine on the spools.

To provide for still further tension on the strands of the twine, and to render the same uniform, I provide a device which I will now proceed to describe.

f represents a saddle constructed to rest upon the twine on the spool and fit thereover when the same is full. Extending up from the saddle and through the hollow spindle T of the flier is a stem or rod, *f'*, having a pin, *f''*, secured therein a short distance below its center. Said hollow spindle T is provided with a sleeve or bushing, *f'''*, having a diameter sufficient to permit a spiral spring, *f⁴*, to loosely surround the stem *f'*, which spring, bearing at its lower end on pin *f''* and at its upper end against a shoulder or offset, *f⁵*, on nut T, tends to press saddle *f* upon the twine on the spool, thus exerting a tension on the strands as they are drawn off; but as the bobbin becomes empty the resilient force of the spring relaxes and the said tension is lessened, compensating for the increased strain necessary to be exerted on the strands to turn the spools as the radius at which the draft is made varies with the varying diameter of the yarn on the spools. The twine drawn from the spools is carried once around guide-spools *g*, fitted to turn between the lower ends of the arms of the fliers, through the lower hollow journals or arbors of the fliers turning in boxes or bushings V, to and as many times as necessary around feed-spools *g'*, secured on shaft *g''*, which is positively driven by a worm-gear, W, secured thereto near one of its ends, which gear W engages worm X, formed on the upper end of shaft I, which latter instrumentality, as has been seen, derives its motion from the main shaft through the medium of gears D E G. It will be seen from the description thus far given that as shafts F and I are turned fliers a will be rapidly revolved, and the strands of twine slowly drawn off therefrom by the revolutions of feed-spools *g'* will be twisted into cords, and that, the feed being positive, the twine will be drawn off and twisted at a regular rate, corresponding with the speed at which the machine is operated, resulting from the positive operation of the fliers and feed-spools.

A represents the rope-flier spool of the rotating head, to which the twisted cords are led from the feed-spools *g'*, and by which flier-spool A they are laid up into a rope, which latter is fed forward or drawn off by the flier-spool as fast as completed. Flier spool A is rigidly secured to a shaft, A', supported so as to turn in bearings A^2, formed in the upper ends of two arms, A^3 A^3, extending upward from the hub *i'* of a gear-wheel, *i*, arranged so as to be supported by and to turn on a short hollow vertical shaft, *j*, sustained by the frame A in the center of the machine. Gear-wheel *i* meshes with and is driven by a gear-wheel, *k*, secured on upright shaft N near the upper end thereof.

Arranged on hub *i'* of gear-wheel *i* and so as to be turned thereon is a gear-wheel, *l*, having a less number of teeth (say by one) than the former wheel. Said gear-wheel *l* meshes with and is driven by a gear-wheel, *m*, affixed upon the upper end of shaft N, which latter gear is provided with one tooth more than

gear-wheel *k*. A bevel gear-wheel, *l'*, formed integral with or secured to gear-wheel *l*, and arranged thereabove so as to also turn on hub *f'*, meshes with a bevel gear-wheel, *m*, of the same size, secured on one end of shaft *K'*, a balance-wheel, *l''*, being secured on the other end of said shaft.

n represents a gear-wheel similar in construction and arrangement on short hollow shaft *j* to gear-wheel *i*; *n'*, the hub of gear-wheel *n*; *n'' n''*, arms depending from said hub and provided with bearings *n³ n³* for a short shaft, *n⁴*, having a drawing-spool, *n⁵*, secured thereon between bearing-collars *n⁶*.

o represents a gear-wheel similar to wheel *l*, arranged on hub *n'* so as to turn thereon, and formed integral therewith or secured thereto is a bevel gear-wheel, *o'*, meshing with a like bevel gear-wheel, *o²*, affixed on the end of shaft *n⁴*.

Secured to shaft N below gear-wheels *m* and *k* is a gear-wheel, *p*, meshing with gear-wheel *n*, and just below said wheel *p*, and also secured to shaft N, is a gear-wheel, *p'*, meshing with gear-wheel *o*. The parts sustained by and rotated on hollow shaft *j* are those comprising what is termed by me the "head."

The construction and arrangement of the parts just described on the lower end of hollow shaft *j* are the same (except in the respect hereinafter noted) as those on the upper end of said shaft; but the devices are arranged in reverse order, gear-wheel *n* having one tooth more than gear-wheel *p*, by which it is driven, and gear-wheel *o* has one tooth less than gear-wheel *p'*, by which it is driven, this construction providing for the driving of gear-wheel *o* more rapidly than gear-wheel *n*, as wheel *l* is revolved faster than wheel *i*.

Secured on the end of shaft *n⁴*, opposite bevel-gear *o²*, is a toothed wheel, *q*, meshing with a like toothed wheel, *q'*, affixed on one end of a shaft, *q''*, turning in a bearing formed in the lower end of a bracket or arm, *q³*, attached to and supported by one of the arms *n²*. Secured to the end of shaft *q'*, opposite toothed wheel *q'*, is a guide or drawing-off pulley, *q⁴*, having a grooved periphery, and on a like shaft projecting from a branch of said bracket *q³* is another pulley, *q⁵*, like in construction to pulley *q⁴*, the edges of the peripheries of which pulleys roll upon each other, the rope or cord passing through the grooves between them, as shown in Fig. 9. The rotation of said pulleys serves to draw off the completed rope and guide it to the receiving or coiling can K.

The operation of the machine will now be readily understood. The several strands of twine leading from each spool are twisted together to form cords by the revolution of the fliers, which cords, as fast as properly formed, are taken up and fed forward or downward to rope-flier spool *h* of the rotary head, where they are laid up into a rope by the revolving head having motion imparted to it through the medium of the gear-wheels on shaft N. As the rope is finished, it is necessary that it should be taken up and fed forward or downward at a regular rate, and this is accomplished by winding the rope once or twice, or more times, if necessary, around feed or flier spool *h*, which is slowly revolved with its shaft *h'* through the medium of gear-wheels *m l l' l''*. The completed rope is led from spool *h* through hollow shaft *j* to and around take-up spool *n⁵*, which is revolved at the same rate of speed as rope-flier spool *h*. The rope is then led between and drawn off by guide-pulleys *q⁴ q⁵* on shafts *q' q''*, driven by toothed wheels *q q'* from shaft *n⁴*, to and laid or coiled in coiler-can K. If the entire twist put into the rope by the revolution of the revolving head were retained therein, the rope would "kink" or snarl when laid in the coiler-can in a way well understood by those skilled in the art. To provide against this happening I take out just enough of the twist put in where the cords are laid up into the rope to avoid the kinking of the rope, and this is accomplished by providing wheel *p*, by which endwise revolution is imparted to take-up spool *n⁵*, with one or more teeth less than wheel *k*, by which rope-flier spool *h* is in like manner revolved, so that take-up spool *n⁵* will be revolved endwise slightly slower than spool *h*, and the rope between spools *h* and *n⁵* will have a portion of its twist taken out or removed before being laid into the coiler-can.

In properly-formed hawser-laid rope fifteen inches of cord are required to be laid up into a rope to form one foot in length of the latter and the parts of my machine are so timed as to secure this end, and the feed and take-up spools, as also the twisting mechanism, being all positively operated, an even tension on each strand and cord laid into the rope, as also an even twist thereon and on the rope, is secured throughout. If it should be desired to put more twist in the strands drawn from the spools than the machine equipped as here shown is capable of accomplishing, it will be necessary only to change gears O and P, replacing the former with a larger gear and the latter with a smaller, and the operation of the other part of the machine can be regulated in the same manner in a way that will be readily understood by mechanics and need not be here described.

I do not confine myself or expect to be confined to the precise construction and arrangement of devices shown, as these may be varied within the limits of mechanical skill.

Having described my invention, I claim—

1. The combination, in a cord and rope making machine, of a series of flier-frames, each adapted to receive a spool with a plurality of strands, gearing for rotating said frames to twist the strands carried thereby into cords, a head at which said cords are formed into rope, provided with feed and take-up spools, and gearing for imparting a double rotation to said feed and take-up spools to effect an axial and endwise rotation of the same, the endwise rotation of the take-up spool being at a slower

rate of speed than that of the feed-spool, substantially as set forth.

2. The combination, in a cord and rope making machine, of a series of flier frames, each adapted to receive a spool with a plurality of strands, gearing for rotating said frames to twist the strands carried thereby into cords, spools g', for receiving said cords, means for actuating said spools g', a head at which said cords are formed into rope, provided with feed and take-up spools, and gearing for imparting a double rotation to said feed and take-up spools to effect an axial and endwise rotation of the same, the endwise rotation of the take-up spool being at a slower rate of speed than that of the feed-spool, substantially as set forth.

3. The combination of a shaft, f, feed and take up spools, and gearing for imparting a double rotation to said feed and take-up spools to cause them to rotate axially and endwise, the endwise rotation of the take-up spool being slower than that of the feed-spool, substantially as set forth.

4. A head provided with feed and take-up spools, mechanism, substantially as set forth, to impart a double rotation to said feed-spool to effect an axial and endwise rotation of the same to lay up a number of cords or strands into a rope and feed the latter forward as laid, and mechanism to impart a similar double rotation to the said take-up spool, but effecting a slower endwise rotation thereof, whereby the rope is taken up and a slight amount of the twist put into the same by the feed-spool is removed, substantially as described.

5. The combination, with take-up spool s^3 and its revolving shaft, of the gear-wheel q, gear-wheel q', and peripherally-grooved take-up pulleys q^2 q^3, and means for supporting said pulleys and last-mentioned gear-wheel, as set forth.

6. The combination, in a cord and rope machine, of a series of flier-frames, each adapted to receive a spool with a plurality of strands to form cords, gearing for rotating said flier-frames, a shaft, f, a hub, s', mounted thereon, bearings s^2 s^3, carried by said hub, a take-up spool, s^4, mounted in said bearings and upon which the cords are laid in rope form, devices, substantially as described, intermediate of said take-up spool and flier-frames for feeding forward the cords, twisting the same into rope, and feeding forward the rope as twisted, means for rotating said hub on said shaft f, and devices for rotating the take-up spool in its bearings, gear-wheels q q', peripherally-grooved take-up pulleys q^2 q^3, a coiler can or receptacle, and gearing for revolving the same, substantially as set forth.

7. The combination, with the fliers a, having the square notches or holes a', of the spool-shaft h, having square ends corresponding to said square holes a', split sleeve b', sleeve c, spline c', and spool e, provided with the hollow barrel e^2, having the groove e^3, as set forth.

8. The combination, in a cord and rope making machine, of a series of flier-frames, each adapted to receive a spool with a plurality of strands, a hollow spindle for each flier, having a gear-wheel, gearing for revolving said gear-wheel, stem f', located in said spindle, spring f^4, pin f^5, nut T, and a saddle, f, suspended on said stem, and twisting and coiling devices, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of April, 1886.

THOMAS B. DOOLEY.

Witnesses:
ARTHUR W. CROSSLEY,
N. H. BROWN.

113&114
(No Model.)

H. HANSON.

WIRE REEL HOLDER.

No. 485,275. Patented Nov. 1, 1892.

Fig. 1.

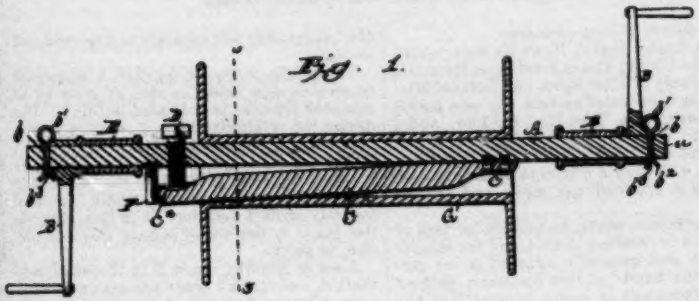


Fig. 2.

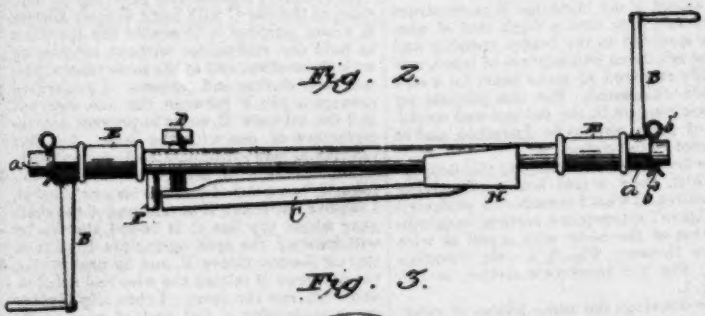
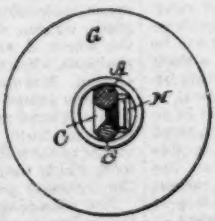


Fig. 3.



Witnesses
A. J. Schmaltz
C. J. Hadsell

Inventor
Hans Hanson
by Wm. Strong
his Attorney.

UNITED STATES PATENT OFFICE.

HANS HANSON, OF MANKATO, MINNESOTA.

WIRE-REEL HOLDER.

SPECIFICATION forming part of Letters Patent No. 603,575, dated November 1, 1898.

Application filed May 9, 1898. Serial No. 680,290. (No model.)

To all whom it may concern:

Be it known that I, HANS HANSON, a citizen of the United States, residing at Mankato, in the county of Blue Earth and State of Minnesota, have invented certain new and useful Improvements in Wire-Reel Holders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to holders for reels of wire used in making fences and for similar purposes and generally adapted to be carried in the hands of two operators putting up the fence and in such a manner that the wire is unwound from the reel as fast as it is needed in the progress of the work.

The object of my invention is to construct the reel-holder so that a fresh reel of wire may be mounted in the holder speedily and with the minimum expenditure of labor, and as readily removed to make place for a new reel when exhausted. For this purpose my invention consists in the devices and combination of parts now to be described, and to be covered in the claims.

In the drawings accompanying this description, which show a reel-holder embodying my invention in what I consider its preferred form, Figure 1 represents a vertical longitudinal section of the same with a reel of wire in place thereon; Fig. 2, a side elevation thereof; Fig. 3, a transverse section on line 3 3, Fig. 1.

In the drawings the same letters of reference designate the same parts in all the views.

By referring to the said drawings it will be noted that my reel-holder consists of a shaft A, of any suitable material, the said shaft being provided at each end with a crank B, of any desired form or size, which cranks fit on and are removably secured to the squared ends *a* of the shaft A by the split spring-pins *b* or any other suitable securing device. The split pins *b*, it will be observed, each consist of a bent piece of metal bent into a loop or eye *b'* to form the head and terminating in the two adjacent legs b^2 b^2, which flare or diverge at their ends b^3 b^3, so that when the spring-pin has been thrust through the holes in the crank B and the squared ends of the shaft these ends will separate and be retained in place.

The middle portion of the shaft A is adapted to receive and hold the reel of wire to be mounted thereon, as indicated in Fig. 1. The device for retaining the reel consists, essentially, in a spring-bar C, bolted to the shaft A at one end *c*, and presenting an angular edge *c'* outwardly, so as to bite into the bore of the wire reel or spool G, so as to retain the same securely against rotation. For this purpose the bar C is preferably square in cross-section, as shown.

A set or binding screw D is threaded into shaft A, and its end bears against and forces outwardly the free end of the retaining-bar C, preferably engaging a recess c^2 therein.

The shaft A is preferably provided on both sides of the bar C with loose flanged sleeves E, whose purpose is to enable the operators to hold the reel-holder without interfering with its rotation, and at the same time to protect their clothes and persons. I preferably arrange a pin F between the one sleeve E and the set-screw D, so as to prevent any interference of one with the other; but this pin may in many instances be dispensed with.

The operation of my reel-holder is as follows: When a reel of wire has been exhausted, I remove the crank B at that end of the shaft near which the bar C is bolted thereto by withdrawing the split spring-pin *b*. I then slip off the one sleeve E, and by unscrewing the set-screw D release the wire-reel spool G, and withdraw the same. I then slip another spool containing a full reel of wire in its place, tighten the set-screw D, and restore the sleeve E and crank B to their proper positions, when the reel-holder is ready for operation. It is operated by two operators, each of whom grasps one of the flanged sleeves E with one hand and the adjacent crank B with the other hand, the operators then proceeding away from the point of attachment of the wire, which they maintain taut by exerting the necessary pressure upon the cranks B.

The clamping device, consisting of the spring-bar C and the binding-screw D, adapts my wire-reel holder to be applied to spools having bores of varying diameters, and while it allows ready removal from or insertion in the wire-reel spool affords a very effective

means for clamping the same in place when in use. With this spring-bar it is not necessary to confine one's self to spools of one given bore, nor to provide such spools with special arrangements for holding them against rotation on the shaft of the reel-holder.

In some cases I find it desirable, though not indispensable, to insert a wedge H between the spool G and the shaft A and bar C before putting the sleeve and crank in place on the shaft A. It will be readily seen that this adds to the security with which the spool G is held against rotation on the shaft A, though in most cases the squared bar C is amply sufficient for this purpose.

While I have herein shown what I consider the best embodiment of my invention, I do not desire to be confined to the same, as it may, manifestly, be varied in many particulars without departing from my invention; but

What I claim, and desire to secure by Letters Patent, is—

1. In a wire-reel holder, a shaft, as A, in combination with a retaining-bar secured thereto at one end and means interposed between the free end of the bar and the shaft to force outwardly the said free end of the bar, substantially as set forth.

2. In a wire-reel holder, a shaft, as A, in combination with a retaining-bar secured thereto at one end and a set-screw threaded into the shaft and bearing against the free end of the retaining-bar, substantially as set forth.

3. In a wire-reel holder, a shaft, as A, in combination with a squared bar secured thereto at one end and a set-screw threaded into the shaft and bearing against the free end of the squared bar, substantially as set forth.

4. In a wire-reel holder, a shaft, as A, having a retaining-bar secured thereto at one end and a set-screw between the shaft and the retaining-bar, in combination with a wire-reel spool and a wedge interposed between the spool and the shaft, substantially as set forth.

5. In a wire-reel holder, a shaft, as A, a retaining-bar secured thereto at one end and means for forcing the free end of the retaining-bar from the shaft, in combination with the sleeves, as E, loosely mounted on the ends of the shaft, substantially as set forth.

6. In a wire-reel holder, a shaft, as A, a retaining-bar secured thereto at one end and means for forcing the free end of the retaining-bar away from the shaft, in combination with the sleeves, as E, loosely mounted on and cranks secured to the ends on the shaft, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HANS HANSON

Witnesses:
C. L. BENEDICT,
Z. Q. A. MARSH.

117&118
(No Model.)

2 Sheets—Sheet 1.

A. F. McINTIRE.

STENOGRAPHER'S CABINET.

No. 577,369. Patented Feb. 16, 1897.

Fig. 1.

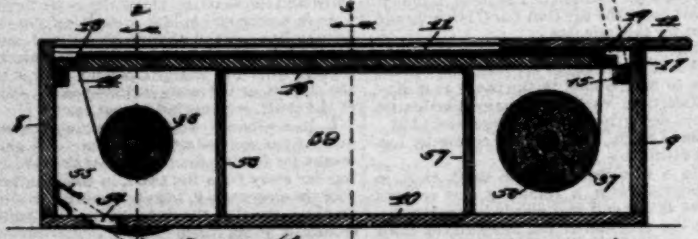


Fig. 2.

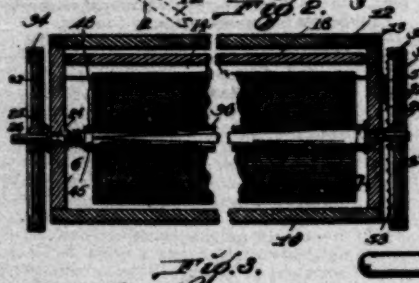


Fig. 4.

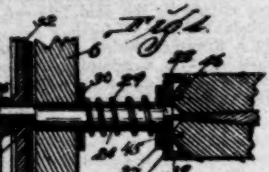


Fig. 3.

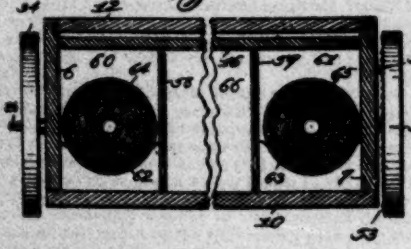
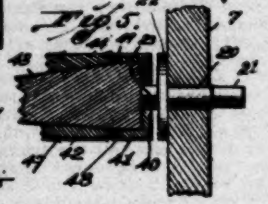


Fig. 5.



Witnesses
M. D. Smith
S. G. Wells.

Inventor:—
Arthur F. McIntire.
By Higdon, Langan & Higdon
Attys.

1198180

(No Model.) 2 Sheets—Sheet 2.

A. P. McINTIRE.

STENOGRAPHER'S CABINET.

No. 577,369. Patented Feb. 16, 1897.

Fig. 6.

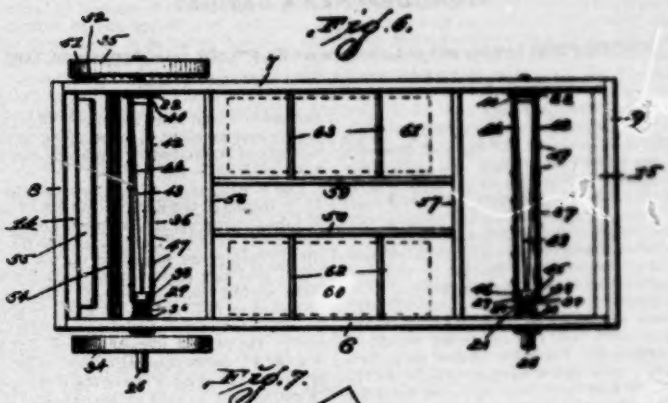


Fig. 7.

Fig. 8.

Witnesses:
W. P. Smith
S. G. Wells.

Inventor:
Oliver P. McIntire
By Wigdon, Cowgan & Wigdon
Attys.

UNITED STATES PATENT OFFICE.

ARTHUR F. McINTIRE, OF ST. LOUIS, MISSOURI, ASSIGNOR TO DESMONDE C. McINTIRE, OF SAME PLACE.

STENOGRAPHER'S CABINET.

SPECIFICATION forming part of Letters Patent No. 577,360, dated February 16, 1897.

Application filed October 17, 1896. Serial No. 609,225. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR F. McINTIRE, of the city of St. Louis and State of Missouri, have invented certain new and useful Improvements in Stenographers' Cabinets, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to stenographers' cabinets; and it consists in the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

Figure 1 is a vertical sectional view taken longitudinally of my improved stenographer's cabinet. Fig. 2 is a vertical transverse sectional view taken approximately on the line 2 2 of Fig. 1 and looking in the direction indicated by the arrow. Fig. 3 is a vertical transverse sectional view taken approximately on the line 3 3 of Fig. 1 and looking in the direction indicated by the arrow. Fig. 4 is an enlarged detail sectional view of one end of the front mandrel and illustrating its construction and operation, parts being broken away to economize space. Fig. 5 is an enlarged detail sectional view of the opposite end of the mandrel shown in Fig. 4, parts being broken away to economize space. Fig. 6 is a top plan view of my improved stenographer's cabinet with the writing-plate and cover removed. Fig. 7 is a side view in elevation of the cabinet in position for transcribing notes and with the cover being used as a prop or leg to support the cabinet in such position. Fig. 8 is a transverse sectional view taken approximately on the line 8 8 of Fig. 5.

In the construction of my improved stenographer's cabinet I employ a rectangular box consisting of the side pieces 6 and 7, which side pieces are framed together by the end pieces 8 and 9 and the bottom 10. A groove 11 is formed in the inner face and near the upper edge of each of the side pieces 6 and 7, and the hand-rest 12 operates between the upper edges of said side pieces, with the flanges 13, which project from the opposite edges of said hand-rest, operating in said grooves 11, thus forming a sliding connection between said hand-rest 12 and the box. A cleat 14 is attached to the inner face of the end piece 8 and near its upper edge, and a corresponding cleat 15 is attached to the inner face of the end piece 9 in horizontal alinement with said cleat 14.

The writing-plate 16 is attached to the cleat 15 by means of the hinge 17, and the free end of said writing-plate rests upon the cleat 14. The hinge 17 allows the writing-plate 16 to tip upwardly, as shown in dotted lines in Fig. 1, and said plate approximately fills the space within the four walls of the box. In the front or free end of the plate 16 is a slot 18, which extends nearly across said plate, and in the rear or hinged end of said plate is a slot 19, corresponding to the slot 18. The hand-rest 12 operates above the writing-plate 16 and closely to said writing-plate.

Near the front end of the side piece 7 is a bearing formed horizontally through said side piece and in which is rotatably mounted the spindle 20. The spindle 20 has the squared portion 21 projecting outwardly from the outer face of the side piece 7. The disk 22 is rigidly fixed to said spindle and operates against the inner face of the side piece 7, and the squared portion 23 of said spindle extends inwardly from said disk. A bearing is formed horizontally through the side piece 6 in alinement with the spindle 20, and the spindle 24 operates in said bearing. Upon the outer end of the spindle 24 is a disk 25, rigidly fixed to said spindle and operating against the outer face of the side piece 6, and the squared portion 26 extends outwardly from said disk. The spindle 24 extends some distance inwardly from the side piece 6, and upon the inner end of said spindle is a disk 27, rigidly fixed to said spindle. The squared portion 28 extends inwardly from the end of said spindle and from said disk 27. An expansive coil-spring 29 is mounted upon the spindle 24 between the disk 27 and the side piece 6, and the disk 30 is loosely placed upon said spindle 24 against the inner face of the side piece 6 and against the outer end of the coil-spring 29.

A traction-wheel 31 is fixed upon the squared portion 21 of the spindle 20, and a corresponding traction-wheel 32 is fixed upon the squared portion 26 of the spindle 24, and said squared portion 26 extends some dis-

tance outwardly from the hub of said wheel 32 to receive the crank 33. Annular grooves are formed in the peripheries of the wheels 31 and 32, and the rubber tires 34 and 35 are placed around said wheels in said grooves.

The hand-crank 33 is removably mounted upon the squared portion 26 of the spindle 24. A mandrel 36 is removably mounted between and carried by the spindles 20 and 24. A similar mandrel 37 is mounted between the rear ends of the side pieces 6 and 7, and the spindles on the mandrels 37 are identical with the spindles already described, with the exception that they do not carry the wheels 31 and 32.

The mandrels 36 and 37 are essentially alike, and they are constructed as shown in Figs. 4 and 5.

A disk 38 has an opening in its center to receive the squared portion 28, projecting from the inner end of the spindle 24, and an annular rim or flange 39 projects inwardly from the edge of said disk, thus forming a cap. A similar cap, consisting of the disk 40, has an aperture in its center to receive the squared portion 23, projecting inwardly from the spindle 20, and an annular flange 41, projecting inwardly from the edge of said disk. Between the cap mounted upon the spindle 20 and the cap mounted upon the spindle 24 is mounted a metallic roller consisting of the portions 42, 43, and 44.

The portions 42 and 44 are essentially alike. Their inner faces are flat and inclined, while their outer faces are horizontal and are segments of a circle. The large ends of the portions 42 and 44 are placed loosely within the flange 39 and are pivotally attached to said flange by means of the pins 45 and 46, which pins extend through said flange and through said inner end and are riveted in position. The portion 43 of the roller has inclined opposite surfaces which engage the flat surfaces of the portions 42 and 44. The large end of the portion 43 is fixed within the flange 41. The edges of the portion 43 are segments of a circle, and when the portions 42, 43, and 44 are in position they form a cylindrical roller. The circular faces of the portions 42 and 44 are upset with a pointed punch, thus forming the teeth 47. Projecting inwardly from the inner edge of the flange 41 is a lug 48, which engages a recess in the free end of the portion 42, and a similar lug 49 engages a recess in the free end of the portion 44, as required to hold said free end in position relative to said flange.

A roll of paper 50 of the desired length is mounted upon the mandrel 37. By sliding the spindle 24 through its bearing and compressing the spring 29 the squared end 28 is withdrawn from the disk 38 and the mandrel may then be removed from the box. The portion 43 may then be withdrawn from between the portions 42 and 44 and the flat faces of the portions 42 and 44 are brought together and they may then be inserted through the opening in the roll, after which the portion 43 is again inserted between the portions 42 and 44, and the insertion thereof acts as a wedge to spread the free ends of the portions 42 and 44 apart, thus forcing the teeth upon said portions into the material of the paper roll. After the parts composing the metallic roller have been thus forced into position the mandrel may be replaced by placing one end upon the squared portion 23 of the spindle 20, sliding the spindle 24 through its bearing, compressing the coil-spring 29, placing the mandrel in position, and then releasing the spindle 24, thus allowing the squared portion 28 to be pressed into position within the disk 38 by the expansion of the coil-spring 29. The free end of the paper composing the roll 50 is passed upwardly through the slot 19 in the writing-plate 16, and thence forwardly along the upper face of said writing-plate and downwardly through the slot 18 in the free end of said writing-plate and is wrapped around the mandrel 36. As the crank 33 is turned in the proper direction the paper is wound upon the mandrel 36 and unwound from the mandrel 37, passing over the writing-plate 16. The hand of the stenographer or writer rests upon the hand-rest and writes upon the paper as it passes above the writing-plate 16. The traction-wheels 31 and 32 extend below the bottom 10 of the box and rest upon the table. During the operation of writing, when it is desired to advance the paper forwardly over the writing-plate 16, the operator may bear down upon the box and slide it forwardly upon the table, and the rubber tires 34 and 35 upon the wheels 31 and 32 will frictionally engage the table and cause the mandrel 36 to be rotated and the paper to be wound upon said mandrel.

A spring-pawl 51 is attached to the outer face of the side piece 7 by means of a screw 52, and in position to have its free end engage the teeth 53 upon the inner face of the rim of the wheel 31, as required to prevent the wheels from being rotated backwardly when the cabinet is drawn backwardly upon the table, and thus prevent the paper from being unwound from the mandrel 36. If the cabinet is not being used upon a table, the mandrel 36 may be operated by manually engaging either of the wheels 31 or 32, or it may be operated by means of the crank 33. When the cabinet is being used upon a table, the crank 33 is removed.

When the stenographer desires to transcribe the notes which have been written upon the paper and which paper has been wound upon the mandrel 36, the crank 33 is placed upon one end of the mandrel 37, the spring-pawl 51 is turned upon the screw 52 into such a position as that its free end will not engage the teeth 53, and then the paper may be rewound upon the mandrel 37 by the operation of the crank 33, and the paper may again be wound upon the mandrel 36 as the notes are transcribed.

A slot 54, having inclined walls, is formed

transversely of the bottom 10 and in a position substantially below the mandrel 36, and said slot is of such a size and shape that it will receive one end of the hand-rest 12, as indicated by dotted lines in Fig. 1.

A channel-bar 55 is attached to the inner face and near the lower edge of the end piece 8 and in position to receive the end edge of the hand-rest 12 after it has passed through the slot 54. The channel-bar 55 is made of springy sheet metal and its edges are flared outwardly and are such a distance apart that the channel between them is normally narrower than the thickness of the hand-rest 12, so that when the edge of the hand-rest is inserted between the flared edges of the channel-bar it will press said edges apart and be firmly gripped thereby.

When the notes are to be transcribed upon a typo-writer, it will be found convenient to place the hand-rest 12 through the slot 54 and in engagement with the channel-bar 55. Then the cabinet may be set upon end at an angle and be supported by said hand-rest.

Partition-walls 56 and 57 are placed within the box and transversely thereof and near the mandrels 36 and 37, respectively. The space between the partition walls 56 and 57 is divided longitudinally by the partition-walls 58 and 59, and in the spaces 60 and 61 thus formed are placed sheet-metal bottoms 62 and 63, respectively, which bottoms are curved to form resting-places for the extra rolls of paper 64 and 65. The space 66 between the walls 58 and 59 may be used to carry pencils, erasers, &c. The writing-plate 16 may be raised as required to gain access to the pencils and paper, as shown in dotted lines in Fig. 1. If the paper is in position above the writing-plate 16 and attached to both of the mandrels 36 and 37 and it is desired to raise the writing-plate, it is only necessary to increase the amount of paper between the mandrels by unwinding it from one of the mandrels. The writing-plate may then be raised without detaching the paper from either mandrel.

After one side of the paper has been used and the paper wound upon the mandrel 36 the end which is attached to the mandrel 37 may be disconnected from said mandrel and then reattached and rewound upon said mandrel 37 inside out. Then the mandrel 37 may be removed from the box and turned around and replaced, and this will bring the unwritten side of the paper upwardly upon the writing-plate 16, and the paper may be run again through the cabinet and the unwritten side used.

I am aware that roll-paper has been used in printing-presses and cash-registers and in other ways, but I am not aware that any device has ever been invented whereby roll-paper was adapted for the use of stenographers as herein set forth.

A cabinet constructed in accordance with the principles of my invention is simple, inexpensive, and will be found very satisfactory for the purposes stated.

I claim—

1. In a stenographer's cabinet, a suitable box, a writing-plate mounted in said box, a hand-rest slidingly mounted in said box above said writing-plate, mandrels rotatably mounted in said box in positions parallel with each other and in alinement with said writing-plate, and a channel-bar attached to the inner face of one of the end walls of said box and a slot formed transversely through the bottom piece of said box and in inclined alinement with said channel-bar, substantially as specified.

2. In a stenographer's cabinet, a suitable box, a writing-plate mounted in said box, mandrels rotatably mounted in said box in positions parallel with each other and in alinement with said writing-plate, a channel-bar attached to the inner face of one of the end walls of said box and a slot formed transversely through the bottom piece of said box and in inclined alinement with said channel-bar, substantially as specified.

3. In a stenographer's cabinet, a suitable box, a writing-plate mounted in said box and mandrels rotatably mounted in said box in positions parallel with each other and in alinement with said writing-plate; each of said mandrels consisting of spindles mounted in the side pieces of said box and removable rollers connecting said spindles; traction-wheels fixed to the front pair of said spindles and holding the front end of said box from the table, substantially as specified.

4. In a stenographer's cabinet, a suitable box, a writing-plate mounted in said box and mandrels rotatably mounted in said box in positions parallel with each other and in alinement with said writing-plate; each of said mandrels consisting of spindles mounted in the side pieces of said box and removable rollers connecting said spindles, each of said removable rollers consisting of the disk 38, the flange 39 projecting from the edge of said disk, the portions 42 and 44 pivotally connected to said flange, the disk 40 having a central aperture, the flange 41 projecting from the edge of said disk and the portion 43 fixed to the flange 41 and the disk 40; traction-wheels fixed to the front pair of said spindles and holding the front end of said box from the table, substantially as specified.

5. In a stenographer's cabinet, a suitable writing-plate, mandrels mounted in positions parallel with each other and in alinement with said plate, and traction-wheels upon one of said mandrels, substantially as specified.

6. In a stenographer's cabinet, a suitable writing-plate, mandrels mounted in positions parallel with each other and in alinement with said plate, traction-wheels upon the ends of one of said mandrels, and a ratchet for controlling the direction of rotation of said wheels, substantially as specified.

7. In a stenographer's cabinet, a suitable

writing-plate, mandrels mounted in positions parallel with each other and in alinement with said plate, traction-wheels upon the ends of the front one of said mandrels, ratchet-teeth upon one of said wheels, and a spring-pawl mounted in position to engage said ratchet-teeth and to turn upon the pivot out of engagement with said ratchet-teeth as desired, substantially as specified.

8. In a stenographer's cabinet, a suitable box, a writing-plate mounted in said box, transversely-alined spindles mounted in bearings in the sides of said box, removable mandrels connecting said spindles and mounted in positions parallel with each other and in alinement with said writing-plate, and traction-wheels upon the outer ends of the front pair of said spindles, substantially as specified.

9. In a stenographer's cabinet, a spindle rotatably mounted in one side of the cabinet, a disk fixed to near the inner end of said spindle and engaging the inner face of the wall of the cabinet, the portion of said spindle inside of said disk being polygonal, a second spindle mounted in alinement with the first-mentioned spindle and in the opposite side of the cabinet, a coil-spring upon said second spindle and inside of the wall of the cabinet, a disk fixed upon said second spindle near its inner end and engaging the inner end of said coil-spring, the portion of said spindle inside of said disk being polygonal, a removable mandrel connecting said spindles and having apertures in its ends to receive the polygonal portions of said spindles, said second spindle being mounted to slide endwise in its bearing and to be held in its normal position by the expansion of said coil-spring, and traction-wheels upon the outer ends of said spindles, substantially as specified.

10. In a stenographer's cabinet, a mandrel consisting of two wedge-shaped pieces, a cap forming a hinge connection between the large ends of said pieces, a wedge-shaped piece to be inserted between the first-mentioned wedge-shaped pieces and from their free ends, a cap attached to the large end of the last-mentioned wedge-shaped piece, lugs projecting from the last-mentioned cap and engaging apertures in the free ends of the first-mentioned wedge-shaped pieces, and teeth projecting from the outer faces of the first-mentioned wedge-shaped pieces, the whole forming a cylindrical roller when the parts are in their normal positions, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR F. McINTIRE

Witnesses:
EDWARD E. LONGAN.
MAUD GRIFFIN.

125&126

No. 646,112. Patented Mar. 27, 1900.

M. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 10 Sheets—Sheet 1.

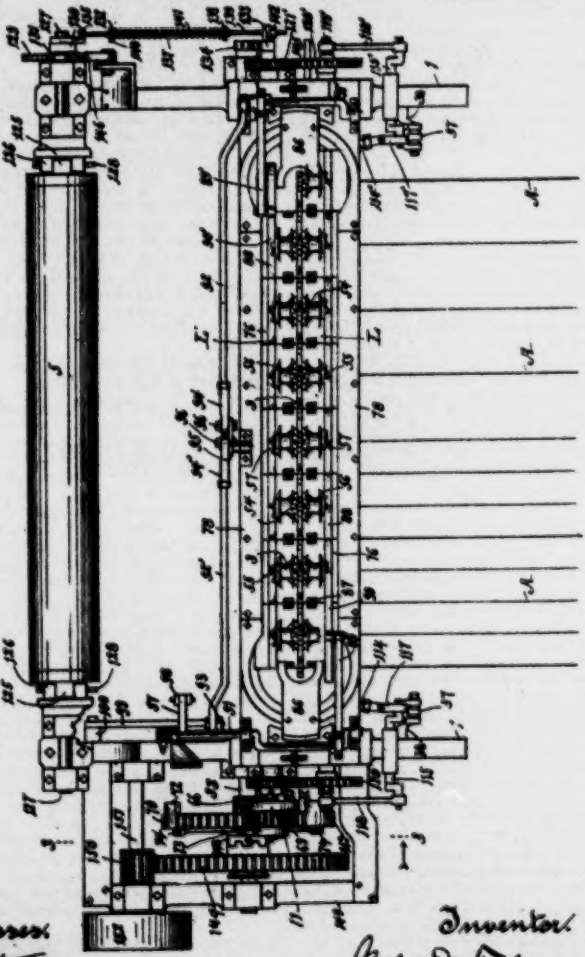


Fig. 1.

Witnesses:

Inventor:
Miles D. Taylor
by Benedict & Morsell
Attorneys

No. 648,112. Patented Mar. 27, 1900

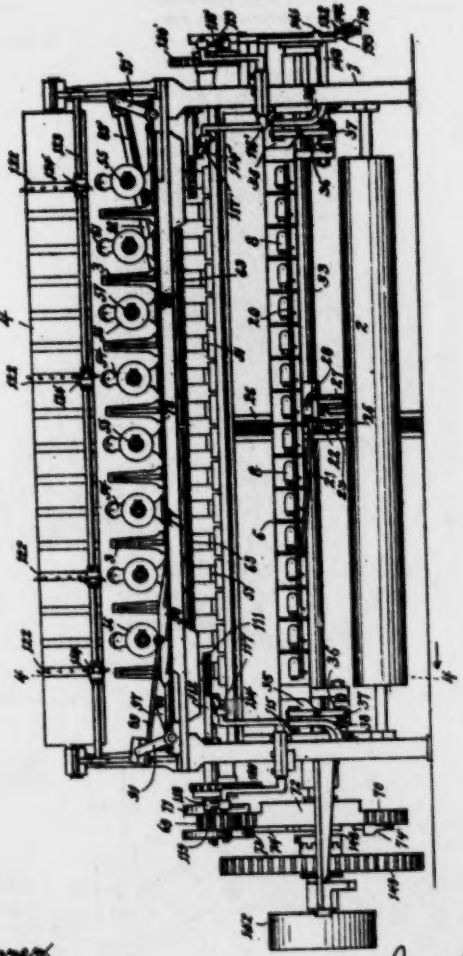
H. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 10 Sheets—Sheet 2.

Fig. 2.



Witnesses:

Inventor:
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By Bemis & Morrell
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129&130

No. 646,112. Patented Mar. 27, 1900.

M. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 10 Sheets—Sheet 3.

Fig. 3.

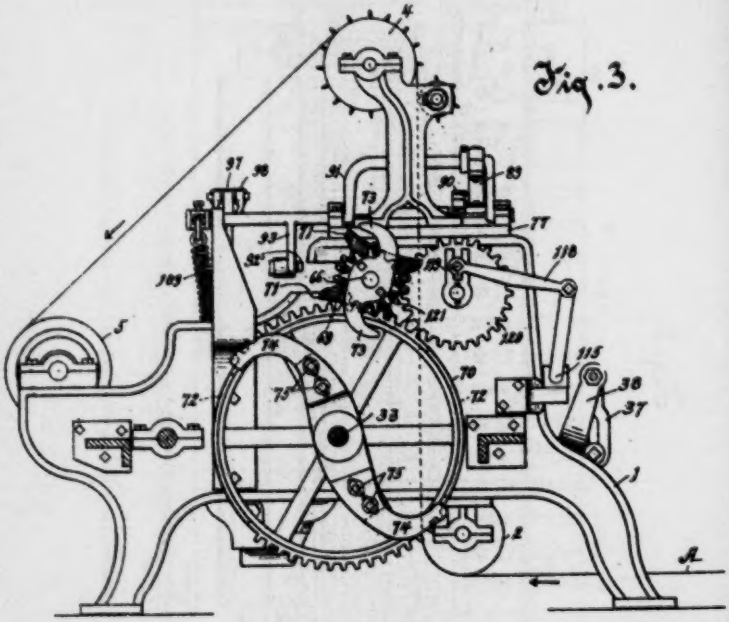
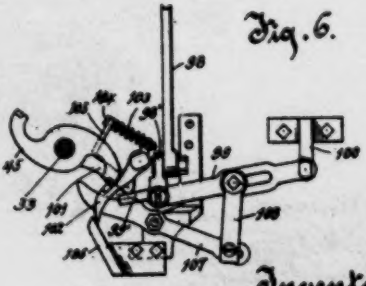


Fig. 7.

Fig. 6.



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Jno. C. Fennell.

Inventor:

Miles D. Taylor

by Randall & Morrell

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131&132

No. 648,112. Patented Mar. 27, 1900.

M. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 10 Sheets—Sheet 4.

Fig. 4.

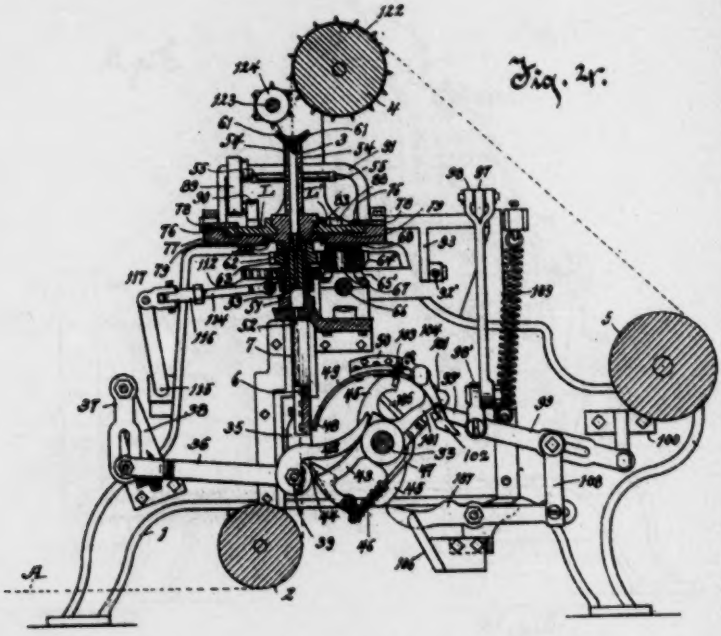
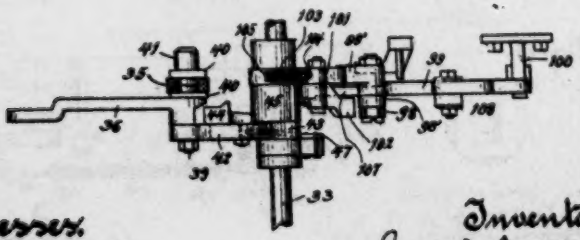


Fig. 5.



Witnesses.

Inventor.

Miles D. Taylor

by Benedict & Mundell

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1338:134

No. 646,112. Patented Mar. 27, 1900.

H. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 10 Sheets—Sheet 8.

Fig. 8.

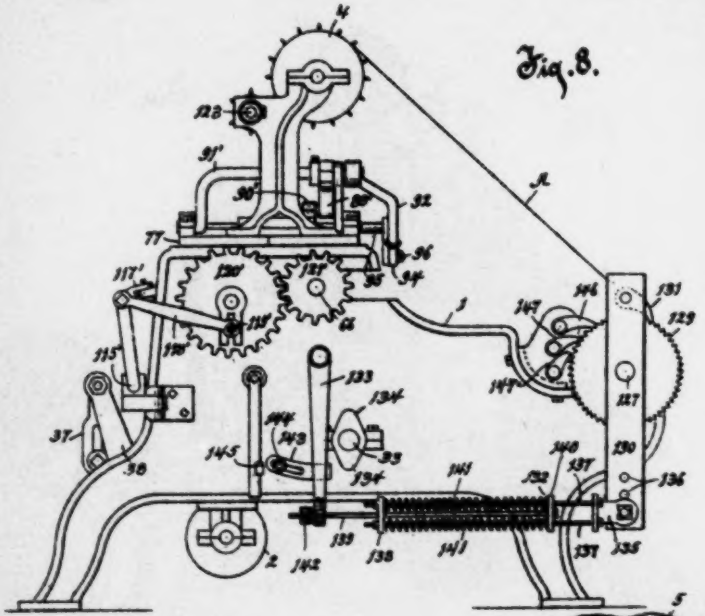

Fig. 10.

Fig. 9.

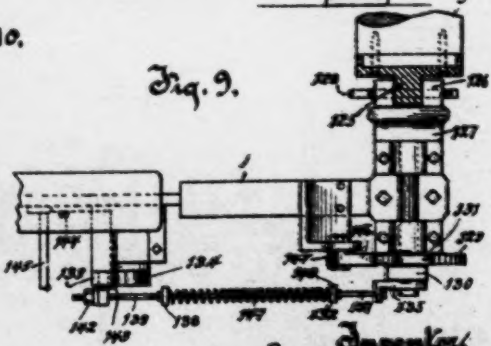

Fig. 11.

Witnesses:

Inventor:

No. 646,112. Patented Mar. 27, 1900.

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WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 10 Sheets—Sheet 6.

Fig. 12.

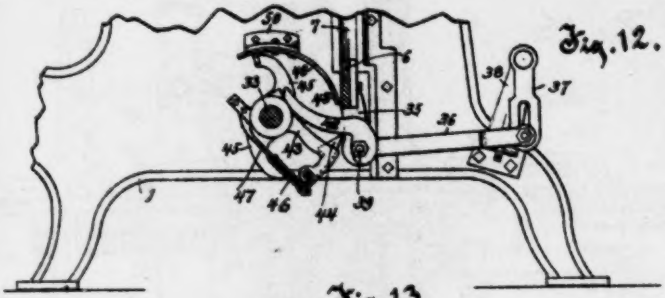


Fig. 13.

Fig. 14.

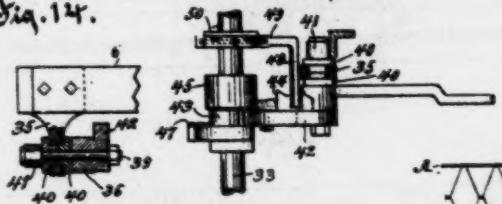


Fig. 32.

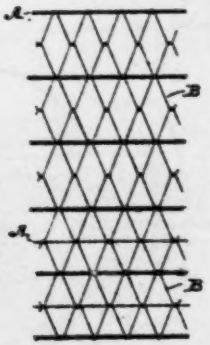


Fig. 33.

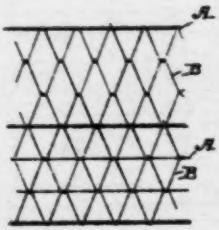
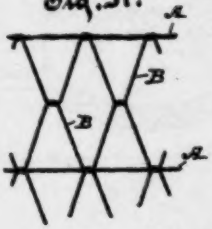


Fig. 31.



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Thomas C. Fennell.

Inventor:
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by Benedict & Morrell
Attorneys

No. 648,112. Patented Mar. 27, 1900.

H. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

137&138

(No Model.) 10 Sheets—Sheet 7.

Fig. 15.

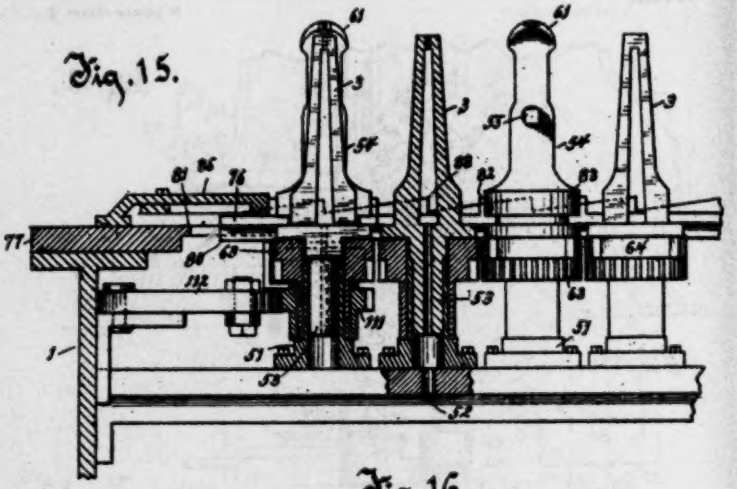
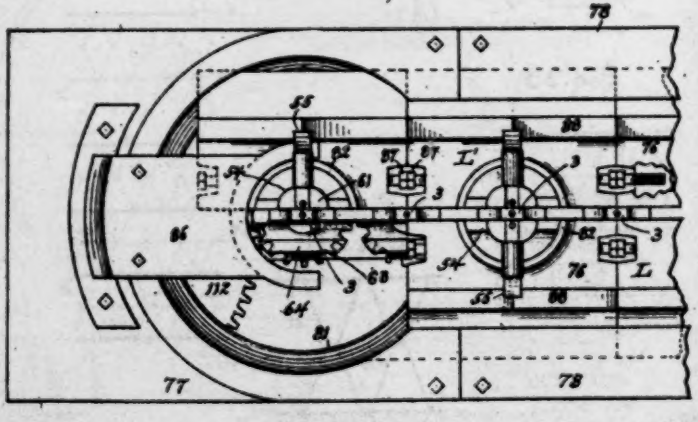


Fig. 16.



Witnesses.

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Arthur F. Fennell

Inventor.

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No. 646,112. Patented Mar. 27, 1900.

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WIRE FENCE MACHINE.

(Application filed Nov. 24, 1899.)

(No Model.) 18 Sheets—Sheet 8.

Fig. 17.

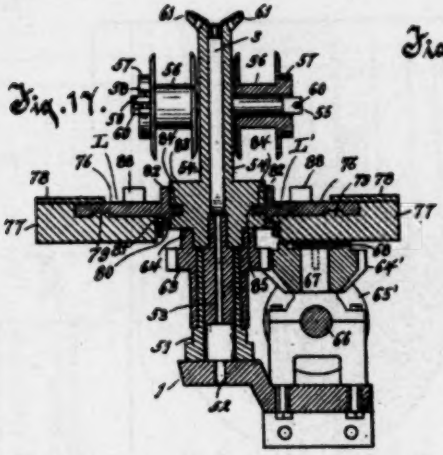


Fig. 19.

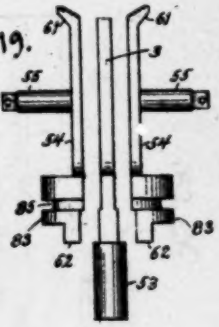


Fig. 20.

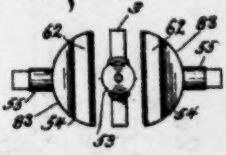


Fig. 18.

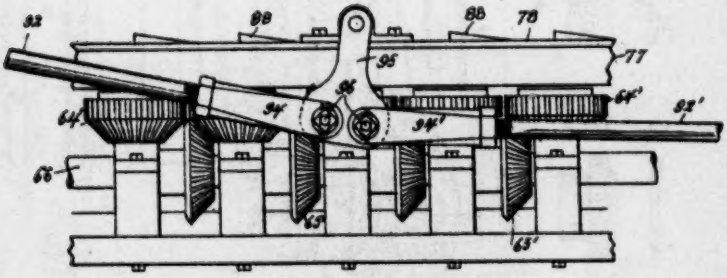
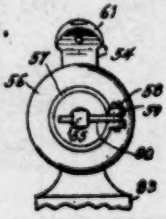


Fig. 21.



Witnesses:

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Arthur A. Smith.

Inventor:

Miles D. Taylor

by Church & Morsell

Attorneys.

141&142

No. 646,112.

Patented Mar. 27, 1900.

M. D. TAYLOR.

WIRE FENCE MACHINE.

(Application filed Nov. 24, 1898.)

(No Model.)

10 Sheets—Sheet 9.

Fig. 24.

Fig. 25.

Fig. 22.

Fig. 26.

Fig. 23.

Witnesses:

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H. D. TAYLOR.

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(No Model.) 13 Sheets—Sheet 13

Fig. 29.

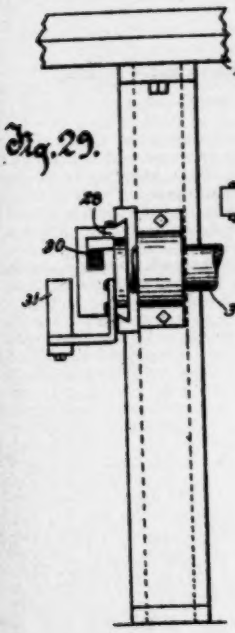


Fig. 27.

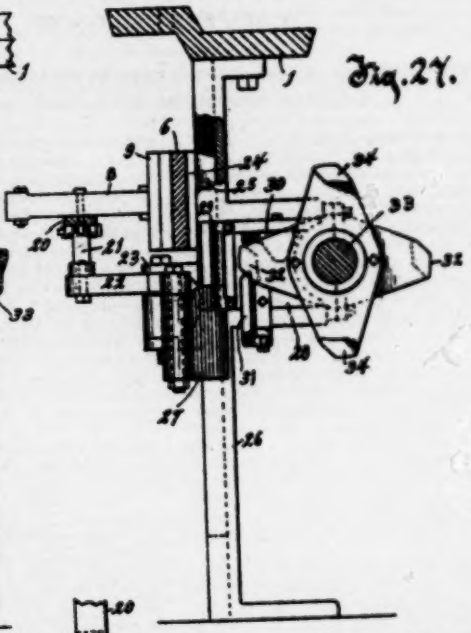


Fig. 30.

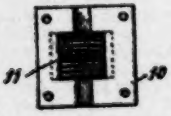
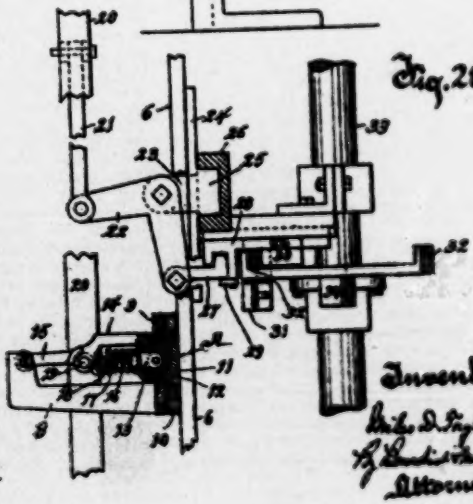


Fig. 28.



Witnesses:

Inventor:

Attorneys

UNITED STATES PATENT OFFICE.

MILES D. TAYLOR, OF JANESVILLE, WISCONSIN.

WIRE-FENCE MACHINE.

SPECIFICATION forming part of Letters Patent No. 646,112, dated March 27, 1900.

Application filed November 24, 1899. Serial No. 738,190. (No model.)

To all whom it may concern:

Be it known that I, MILES D. TAYLOR, of Janesville, in the county of Rock and State of Wisconsin, have invented a new and useful Improvement in Wire-Fence Machines, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

My invention relates to machines of a class that are adapted to manufacture wire-fence fabric ready to be secured to posts to form a complete fence. The fabric manufactured by my improved machine has longitudinal strands or cables forming a warp and cross-strands forming a woof, the woof being woven into or so twisted about the warp-cables as to permanently secure them to the warp forming the complete flexible fabric. The warp-cables are substantially straight longitudinally of the fabric, and the cross-strands run obliquely from cable to cable or to engagement with each other between the cables, forming diamond-shaped or triangular open meshes.

The object of the invention is to provide an improved machine of comparatively simple and inexpensive construction that is strong and durable in all its parts and that is capable of feeding and weaving the wire supplied to it into a complete fence fabric in any of several analogous forms, all of which forms are attractive to the eye and are adapted for ready use, and of winding the completed fence fabric up into rolls convenient for transportation and for building into a fence.

The invention consists of the machine, its parts and combinations of parts, as herein described and claimed, or the equivalents thereof.

In the drawings, Figure 1 is a top plan view of a machine embodying my improvements, except that a fabric-carrying roll and a guide located above the principal part of the machine are omitted to exhibit the principal parts of the machine completely. A minor part of the construction is broken away to exhibit an otherwise hidden part below. Fig. 2 is an elevation of my improved machine as seen from the front or from that side which is at the bottom of the sheet as shown in Fig. 1. Fig. 3 is a section on line 3 3 of Fig. 1 looking toward the right, the figure showing an end view of principal parts of the machine. Fig. 4 is a section on line 4 4 of Fig. 2 looking toward the left, showing many of the parts of the machine seen on that section, but some parts being omitted for clearness of representation of the parts shown. Fig. 5 is a top plan of parts of the mechanism shown in Fig. 4 in the foreground, some parts being in section. Fig. 6 shows with clearness in elevation parts found also in Fig. 4, but in relatively-different positions. Fig. 7 is a detail of parts shown obscurely in Figs. 4, 5, and 6 and in a position reverse to the positions in Figs. 4 and 6. Fig. 8 is an elevation of the machine at the end at the right in Figs. 1 and 2, parts being in section for convenience of illustration. Fig. 9 is a view of a fragment of the fabric-winding roll in section and related operating mechanism, the mechanism being that shown at the right and near the bottom in Fig. 8. Figs. 10 and 11 show details of the construction of the mechanism in Fig. 9. Fig. 12 shows a detail of the warp-wire-feed mechanism located on the inside of the frame at the right in Figs. 1 and 2. Fig. 13 is a plan, parts in section, of a detail of the mechanism shown in Fig. 12. Fig. 14 is a detail, mostly in section, of mechanism shown in Figs. 12 and 13. Fig. 15 is a view, largely in section, of a fragment of the frame, the bed thereon, some of the warp-wire or cable guides, two of the woof-wire carriers, and some related mechanism. Fig. 16 is a top plan view of a fragment of the bed and of some of the cable-guides and three of the woof-wire carriers thereon with related devices and mechanism. Fig. 17 is a vertical section transversely through the bed, a cable-guide, two woof-wire carriers, the actuating traveling blocks or travelers, and some related mechanism. Fig. 18 is a detail in elevation of a fragment of the frame and bed and of mechanism for revolving and causing the travel of the woof-wire carriers on the bed. Fig. 19 is a detail of a pair of woof-wire carriers and the sometime-interposed cable or warp-wire guide, the parts being disassembled for clearness of illustration. Fig. 20 is a plan view from below of the devices shown in elevation in Fig. 19. Fig. 21 is a detail of a part of a woof-wire carrier with its spool and wire-tension device in the foreground. Fig. 22 is a top plan view of the

extremities of the bed, it being broken away medially and the central portion being omitted, and mechanism therewith for rotating the warp-wire guides and the woof-wire carriers and for guiding and advancing the woof-wire carriers. A portion of the bed is omitted and a part of the supporting-frame is shown in section. Figs. 23 and 24 show in detail devices seen in Fig. 22 at the respective ends of the bed for advancing or causing the travel of the blocks or travelers in a semicircular direction at the ends of their route of travel. Fig. 25 is an under side view of two of the traveling blocks or travelers, the top view of which is shown in Fig. 10. Fig. 26 is an end view of one of the traveling blocks or travelers. Fig. 27 is an elevation, parts being in section, of mechanism for gripping and advancing or feeding the cables or warp-wires into and through the machine. Fig. 28 is a plan view, parts being in section, of substantially the same mechanism shown in elevation in Fig. 27. Fig. 29 is an elevation of some of the mechanism shown in Fig. 27 at a right angle thereto. Fig. 30 is an inner end view of a device shown in Fig. 28 for gripping a cable or warp-wire. Figs. 31, 32, and 33 show fragments of wire-fence fabric in forms produced by my improved machine.

In the drawings, 1 represents the frame of the machine, which should be of such size and form as to suitably adapt it for the support of the operative mechanism.

A machine of the character of my improved machine can be made of any width desired for the manufacture of very wide fence fabric; but in the drawings I have shown a machine of a width sufficient to manufacture fabric somewhat wider than is ordinarily required for a fence, and this machine may be used for manufacturing a fabric of such width or for manufacturing a fabric of any narrower width, as desired.

In manufacturing wire-fence fabric with this machine the cables or warp-wires A A are supplied to the machine in parallel strands in such numbers as are desired for the fabric to be woven. These warp-wires A A run under the idle roll 2, Figs. 1, 2, 3, and 4, and thence upwardly through the warp-wire guides 3 3, and thence after being interwoven in the guides by the woof-wires over the idle fabric-carrying roll 4, and thence to the fabric-winding roll 5, on which the wire-fence fabric is wound up. The warp-wires or cables A A may consist of single straight steel wires or may be severally formed of twisted wires, as shown in Figs. 31, 32, and 33. It is desirable to have extra strong strands at the two edges of the fabric especially, and for this purpose the twisted strands or warp-wires are desirable, and such twisted strands or wrap-wires may be used through the fabric at intermediate lines or the single-wire strands may be employed exclusively or intermediate of and with the twisted strands.

For advancing or feeding the warp-wires through the machine a warp-feed bar 6 is employed, which bar is reciprocable vertically in ways 7 7 therefor in the frame, Figs. 2, 4, 12, 27, and 28. This feed-bar 6 is located directly below the warp-wire guides 3 3 and is adapted by its upward movement to carry the warp-wires when gripped to it upwardly through the guides 3.

For feeding the warp-wires into the machine it is necessary that the wires should be gripped and held firmly to the bar 6 during its upward movement. For this I employ devices and mechanism as follows: A series of laterally-projecting studs 8 8, Figs. 2 and 28, each provided with a flat foot 9, are bolted to the side of the warp-feed bar 6. A base-piece 10 is preferably employed, interposed between the foot 9 of the stud and the bar 6 to support the stud at a little distance from the bar. The foot 9 and the base-piece 10 are each provided with a central aperture, and a grip-plate 11, preferably of steel, with a roughened face, is placed in the base-piece 10, with its face exposed through the aperture, and a grip-block 12 is fitted loosely in the aperture in the foot 9 and is swiveled on a block-stem 13. The block-stem 13 is movable endwise through the overturned extremity of the arm 14, which arm 14 is hinged at its other extremity to an arm 15, and this arm 15 at its distant extremity is hinged in the overturned outer extremity of the stud 8, the two arms 14 and 15 forming as thus mounted a toggle-joint lever. An expansion-spring 16 is interposed between the end of the stem 13 and an adjustable resistance-block 17, which block is provided with a screw 18, turning into the block and resisting against an opposed part of the arm 14. The spring 16 bears at one extremity against a shoulder or collar on the stem 13. The mounting of the grip-block 12 in the arm 14 is adapted by means of the spring 16 to hold the block 12 yieldingly toward the grip-plate 11. The toggle-joint, including the arms 14 and 15, is adapted by swinging the joint laterally to release the block 12 from its grip on the warp-wire A, which passes upwardly and is held between the plate 11 and the block 12. One of these gripping devices is located on the feed-bar 6 directly below each of the warp-wire guides 3, mounted in the plane of the bed of the machine above. The pivot-pin 19, that hinges the arms 14 and 15 together in a toggle-joint, extends through the connecting-rod 20, thus connecting all these toggle-joints and compelling synchronous movement thereof. A pitman 21 is pivoted at one end to the connecting-rod 20 and at the other end to one arm of a bell-crank 22, which bell-crank is pivoted at its angle on a lug 23, fixed on a plate 24, secured to the bar 6, and provided with a bearing-block 25, that travels vertically in ways therefor in a standard 26, forming a part of the frame. The other extremity of the bell-crank 22 is provided with a plate-link 27, hinged to the arm of the bell-crank and provided with a laterally-turned extrem-

ity forming a head that fits movable vertically in a groove therefor in the horizontally-reciprocable slide 28. A strap-guard 29, secured to the slide 28 by screws, holds the plate-link 27 in place movably in the slide. The slide 28 is mounted reciprocable horizontally in ways therefor in the frame. The slide is provided with an inner tappet 30 and an outer tappet 31, which are severally adjustable laterally thereon by means of screw-bolts through slots in the tappets and turning into the slide. Cams 32 32 on oppositely-extending radial arms on the driving-shaft 33 are adapted to contact with the inner tappet 30 and draw the slide 28 toward the shaft, while cams 34 34 on oppositely-disposed radial arms on the shaft 33 are adapted to contact with the tappet 31 and push the slide 28 laterally away from the shaft 33. It will be understood that the mechanism just described is adapted to reciprocate the connecting-rod 20, and thereby to move the grip-block 12, thus gripping and releasing the warp-wire A, the disposition of the parts of the mechanism being such that the block 12 is made to grip the wire just before and during the upward movement of the feed-bar 6 and to release the wire just before and during the downward movement of the feed-bar. The disposition of the cams 32 and 34 on the shaft 33 is such that the slide 28 is intermittently reciprocated, causing the alternate gripping and release of the warp-wire A.

The warp-wire-feed bar 6 and its load assumes by gravity its lowest position. To move this feed-bar and its load upwardly, and thereby to feed forward the warp-wires, I provide the following mechanism: Near each end of the bar it is provided with a leg 35, Figs. 2, 4, 5, 12, 13, and 14, and these legs at their lower extremities are pivoted medially to the swinging tappets 36. These tappets 36 are pivoted at their rear extremities adjustable radially in the hangers 37 37, which are hinged on and depend from brackets 38 38, rigid to and forming a part of the frame. The tappets 36 are made adjustable in the hangers 37 toward and from their axis by bolts adapted to be moved in slots therefor in the hangers toward and from their common axis. The legs 35 are pivoted to the tappets 36 by means of bolts 39 and collars 40 40, one at each side of each leg, which collars have projecting annular flanges or sleeves that surround the bolt and serve for the bearings of the legs thereon, the flanges projecting toward each other and substantially meeting within the legs. Antifriction-wheels 41 41 on the bolts 39 are adapted to travel on vertical ways or bearings therefor on the frame 1, thereby supporting and guiding the movement of the wire-feed bar 6 reciprocably vertically. The rigid forwardly-projecting toes 42 42 of the tappets 36 36 are in the path of wipers 43 43, loose on the driving-shaft 33. Dogs 44 44 are so pivoted on the wipers 43 that their engaging catches are normally in the paths of the steel-faced cams 45 45, fixed on the shaft 33. There are two of these cams 45, located severally at opposite sides of the shaft 33, adapted to temporarily engage each of the dogs 44. Expanding-springs 46 46 are adapted to hold the catches on the dogs 44 44 normally in the paths of the cams 45 45, these springs being coiled loosely about rods 47 47, that extend from a support therefor on the hubs of the wipers 43 at the opposite side of the shaft 33 to and loosely through rearwardly-projecting parts of the dogs 44. Stops 48 48, fixed on the frame, project therefrom laterally into the path of the laterally-projecting portions of the front beveled or inclined ends of the dogs 44 44 and are adapted, as the dogs revolving with the cams 45 come thereto, to contact against these beveled front extremities of the dogs and force them radially out of engagement with the cams 45. It will be understood that the construction is such that as the shaft 33 rotates the cams 45 engage the dogs 44 and carry the wipers 43 with the cams, thereby lifting the tappets 36 and the wire-feed bar 6 until the dogs 44 contact with the stops 48 and are pushed thereby out of engagement with the cams 45, whereupon the wipers 43 under the weight of the tappets 36 thereon and their load fall back into their normal positions, which are at the lowest point to which the wire-feed bar 6 can go, and at which limit of movement downwardly it is supported by the toes 42 of the tappets 36, resting on the wipers 43 and their shaft 33, as shown in Figs. 4 and 12. The length of the movement of the bar 6 vertically and of the feed of the warp-wires is regulated by the adjustment of the stops 48. These stops 48 are on the extremities of curved arms 49 49, that are mounted adjustably in the direction of the circle of the arc of the motion of the dogs 44. To accomplish this, the arms 49 are bolted to brackets 50 50, rigid on the frame, the bolts passing through slots therefor in the arms 49. The warp-wires on being fed to and passing upwardly through the guides 3 are woven into the fabric, which fabric then passes over the fabric-carrying roll 4 and to and is wound upon the fabric-winding roll 5 by a concurrent intermitting winding movement that will be hereinafter described. By these means the warp-wires are fed into and through the machine and are kept constantly at a suitable tension and are carried forward throughout by synchronous movement of the different parts of the machine.

For carrying and feeding the woof-wires and leading them forward and back across the plane of the fabric, twisting them about the warp-wires and about themselves, and thus weaving them into and forming the wire-fence fabric I employ the following mechanism: The warp-wire guides 3 3 are in the general form of elongated spindles provided with a central bore or aperture for the passage therethrough upwardly of the warp-wires. Of these guides as many are provided as will

equal the number of warp-wires that by any possibility will be required in any fabric to be manufactured on the machine. In manufacturing the wire fabric, however, in my improved machine it is not necessary to use as many warp-wires as there are spindles, because the woof-wires may be twisted, and thus woven about themselves, thereby forming meshes without the use of warp-wires except at the longitudinal edges of the fabric and at such medial longitudinal lines thereof as may be desired. These guides 3 3 are severally supported in upright position rotatably in and on a hollow pedestal 51, which pedestals are secured to and supported in permanent position on a rail of the frame I. Apertures 52 through the rail are provided for the passage of the warp-wires upwardly. So much of the lower portions of the guides 3 as enter the pedestals 51 are cylindrical, as shown at 53, Figs. 15 to 20, and the portion of the guide above this cylindrical portion is flattened and extended laterally in both directions, normally in the direction of the length of the bed of the machine. These flattened and laterally-extended wings of the guides form shoulders that rest on the top of the pedestals 51 and also form flat side surfaces for receiving against them the normally-abutting woof-wire carriers. Woof-wire carriers 54 54 are located normally on opposite sides of warp-wire guides 3. These woof-wire carriers are substantially as long vertically as the laterally-flattened portions of the guides 3 and are of substantially the same width as the guides. These carriers are employed in pairs opposite every alternate guide 3, except that when the alternate guide is at the end of the series, only one carrier is employed, the opposite carrier to make up the pair being omitted, Fig. 1. These carriers are each provided medially with a laterally-projecting arbor 55, on which a spool 56 is mounted rotatably. These spools carry the woof-wire wound thereon. To regulate the tension of the wire as it leaves the spool 56, I provide means for resisting the free rotation of the spool 56, which consists of a flexible metal strap 57, passing around the hub of the spool, the two ends of which strap come near together and are provided with a screw 58, adapted to draw the ends toward each other, and thus tighten the strap more or less snugly about the hub of the spool. One extremity of the strap is provided with a lug 59, that projects laterally therefrom, so as to bear against a pin 60, inserted transversely through the arbor 55, and thus prevent the rotation of the tension-strap and yieldingly retarding the rotation of the spool. The upper extremities of the carriers 54 are preferably turned outwardly obliquely above the spools 56, and these oblique terminations or heads 61 of the carrier are each provided with an aperture inclining inwardly upwardly for the passage therethrough of the woof-wire as it is uncoiled from the spool and is fed into the fabric being woven. Each carrier 54 is provided at its lower end with a transversely-disposed tongue 62, which fits slidably in a transverse groove therefor on the upper face of a pinion 63. The pinions 63 are each footed on a shoulder on the several pedestals 51, about which pedestal the pinion is fitted and rotates. The pinions 63, Fig. 22, are each provided with two transverse grooves across its upper face, (one for the tongue of each carrier 54, of a pair of carriers,) formed by the outer ribs 64 64 and the middle mutilated rib 65, which is omitted centrally, providing a space for that portion of the interposed guide 3, Figs. 15 and 17. It will be understood that the rotation of these pinions revolves the carriers 54 thereon and the guides 3, interposed between them, about the warp-wires extending upwardly through the guides, thus coiling the woof-wires about the interposed warp-wires or twisting the two woof-wires about each other in the absence of an interposed warp-wire.

For rotating the pinions 63 intermittently at the proper moment each pinion meshes with a double pinion 64', Figs. 17 and 18, the beveled teeth of which mesh with a beveled pinion 65' on the counter-shaft 66, having its bearings in suitable boxes therefor on the frame. The double pinions 64' are severally mounted on a stud 67, projecting from the boxes in which the counter-shaft 66 has its bearings, and the double pinions are held in position thereon by a cap-plate 68, secured to the studs 67 by a screw. The cap-plate extends laterally over the upper end of the beveled pinion. The counter-shaft 66 is rotated intermittingly from the main shaft 33, Figs. 1 and 3, by a pinion 69 on the counter-shaft, that meshes intermittently with the teeth on the mutilated cog-wheel 70 on the main shaft. Concave stops 71 71 on radial arms fixed on the counter-shaft 66 ride on rim-flanges 72 72, projecting laterally from the wheel 70 opposite the untoothed portions of the perimeter, and prevent the movement rotatably of the counter-shaft while the untoothed portion of the perimeter of the wheel 70 is passing the pinion 69. To insure the prompt and proper initial rotative movement of the counter-shaft 66 when the pinion 69 comes to the toothed portion of the wheel 70, I provide radially-extending curved arms 73 73 on the counter-shaft 66, adapted to be engaged at the proper moment by the radially-projecting arms 74 74 on the main shaft 33. These radial arms 74 74 are curved forwardly in the line of motion at their outer extremities and are made in two parts, the outer ends of the arms being secured to the inner or hub portion thereof by bolts 75 75, passing through slots, preferably at a slightly-oblique angle to radii of the shaft, whereby the extremities of these arms may be moved outwardly or inwardly and slightly advanced forwardly or retrieved, thus making the arms adjustable with reference to securing the engagement thereof with the arms 73 at the proper mo-

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ment to initiate the rotation of the countershaft 66 when the pinion 63 comes to teeth on the wheel 70. The construction and relation of the parts are such as to cause a rotation of the pinion 63 once and a half around by the action of each of the two segmental sections of teeth on the mutilated wheel 70 as it rotates. This results in carrying each woof-wire in a coil once and a half around the interposed warp-wire or the intermeshing woof-wire in the absence of the warp-wire.

For carrying the woof-wires from one weft-wire to another or transversely of the fabric limitedly I employ the following mechanism: A considerable number of push-blocks 76 76, Figs. 1, 2, 4, 16, 17, 18, 25, and 26, arranged in adjacent lines L L' and adapted to travel, respectively, in opposite directions, are mounted and slidable on the bed 77, that forms a part of the frame 1. These push-blocks 76 are duplicates of each other and are adapted to travel in succession one after the other in a substantially-endless procession in the two lines L and L', the blocks at the ends of the lines of travel turning around from one line into the other. The blocks rest on the bed 77 and are let into the bed, so that their upper surfaces are flush with the top of the bed, and guards 78, secured to the upper surface of the bed, project over the push-blocks and retain them movably in position on the bed. Raised ribs 79 79 on the bed extend in straight lines thereon along the route of the travel of the push-block in straight horizontal lines, and these ribs or guides enter grooves 79' therefor in the under surface of the push-blocks and also serve as guides for the movement of the blocks along the straight lines of their travel. The push-blocks are also provided near their inner edges with downwardly-projecting and laterally-turning flanges 80 80, that fit against and under the edge of the bed about a longitudinal aperture therein, which aperture at its extremities is enlarged and curved in a circular direction, this edge 81 of this aperture in the bed forming a guide against which this flange 80 on each of the push-blocks may bear movably during their travel along the straight lines of their route. Each of these push-blocks has a substantially-semicircular recess in its inner edge, medially about which recess, projecting upwardly and downwardly from the push-block, there is a semicircular flange 82, which flange fits movably about the semicircular base 83 of the woof-wire carrier 84. A semicircular horizontally-projecting tongue 84 on the block 76 enters a groove 85 therefor in the carrier-base 83, Figs. 17, 19, 25, and 26. Each of these push-blocks is thus so fitted to and about the base of a carrier 84 that when a push-block is caused to travel ahead in its route it carries its partially-encircled woof-wire carrier with it. At the extremities of the lines of travel of the push-blocks and opposite the ends of the row of warp-wire guides 3, Figs. 1, 15, and 16, there are located semicircular guides 86 86, one at each end, secured at their outer extremities to the frame and at their inner extremities terminating in a semicircular concave end located and adapted to receive against it the semicircular flange or collar 82 on each push-block 76 as the push-block is advanced thereto and to guide the push-block as it is advanced at the end of the route of travel around from one line of blocks to the other reversely-traveling line of blocks. These push-blocks during their travel on the straight lines bear against each other end to end, and the line of blocks is advanced by pushing one or two of them ahead. As these blocks may, by reason of wear or otherwise, require a slight adjustment relatively to each other, I advisably provide adjusting-bolts 87 87, turning into the ends of these blocks, the heads of which bolts on adjacent blocks register with each other and are adented to contact and provide a proper adjusted bearing for the blocks.

For advancing the blocks in their travel intermittently on the straight lines I provide actuating mechanism as follows: Each of the push-blocks is provided on the upper surface thereof with two rack-teeth 88 88, Figs. 1, 2, 3, 4, 15, 16, 17, and 18, facing rearwardly of the motion of the blocks. The distance of these teeth apart on each block and on each line of blocks when in position on their straight route is equal to the distance apart of the apertures through the axes of the warp-wire guides 3 3. A pawl 89, Figs. 1, 2, 3, and 4, provided with a toothed pawl-block 90, pivoted to the free end of the pawl and adapted to engage the teeth 88 on the push-blocks, is mounted on the crank of a rock-shaft 91 and is adapted by the oscillation of the shaft to advance the line L of the push-blocks intermittently. A complementary pawl 89', Figs. 1, 2, and 8, provided with a toothed block 90' and mounted on the crank of the rock-shaft 91', is adapted by the oscillation of the rock-shaft to advance the line L' of the push-blocks intermittently in the opposite direction to the motion of the push-blocks in the line L. The crank-arm on the rock-shaft 91' is connected by a rod formed of two members 92 92' to a radial crank-arm 93 on the rock-shaft 91, Figs. 1, 3, and 4, which crank-arm 93 projects from the rock-shaft radially in an opposite direction to the crank on which the pawl 89 is pivoted. The two members 92 92' of the connecting-rod, Figs. 1 and 18, are severally provided with a head 94 94', into which the rods turn by screw-thread, thereby providing for their longitudinal lengthening or shortening, and the heads 94 94' are severally secured pivotally to the free extremity of an arm 95, pivoted on and depending from the frame. These heads are secured to the arm 95, adjustable radially toward and from its axis by bolts 96 96, movable in slots therefor in the arm. By this construction the throw of the members 92 92' of the connecting-rod can be regulated to suitably adjust

the movements of the block-moving pawls 89 89'.

To intermittingly oscillate the rock-shaft 91, it is provided with a radial arm 97, which is connected by a rod consisting of two hinged members 98 98' to an actuating-lever 99, pivoted at one extremity to a bracket 100 on the frame, Figs. 1, 3, 4, and 5. The free extremity or toe 99' of the lever 99 is in the path of a radial arm or wiper 101, loose on the main shaft 33. The wiper 101 is provided with a dog 102, pivoted thereon and so disposed that its steel-faced catch is in the path of and adapted to be caught by the steel-faced cams 45, Figs. 4, 5, 6, and 7. The dog 102 is held normally releasably in the path of the cams 45 by an expansion-spring 103, coiled about a rod 104, that is supported on a standard 105, fixed on the wiper 101, which rod projects loosely through an eye fixed in a rearwardly-projecting part of the dog 102. The wiper 101 by means of the contact of the dog 102 with a cam 45 is carried around therewith until the dog contacts with a stop 106, fixed on the frame, which stop is so disposed as to engage the beveled front end of the dog and force it out of engagement with the cam. An actuating-lever 107, pivoted medially on the frame, is connected at its rear end by a link 108 to the lever 99, and the free extremity of this lever 107 is also in the path of the cams 45 and is so disposed, Fig. 6, that just after the dog 102 is released from a cam 45 the cam 45 will engage the lever 107 and tilt it, forcing the lever 99 back to its initial position, and thereby oscillating the rock-shaft 91 in the other direction. The link 108 is connected adjustably both to the lever 99 and to the lever 107 by bolts passing through slots therefor in the levers. By this means the relative throw of the levers may be adjusted. A contractile compensating spring 109 is attached at one end to the frame and at the other end to a short radial arm on the rock-shaft 91 and is adapted to ease the movements and assist in retrieving the pawls 89 89'.

For advancing the push-blocks severally in their route of travel around the ends of the line of guides 3 3 I provide rotatable pushers, Figs. 23 and 24, one at each end of the route of travel, which severally consist of a finger 110 110', mounted on a pinion 111. The fingers at the two ends of the route of travel are of such different form as adapts them for contacting with the pins 113 113 on the under side of the push-blocks 76 in the situations in which they are placed, Fig. 22. These pinions 111 encircle the hubs of the two end pinions 63 and are footed revolubly on a shoulder therefor on the end pedestals 51, Figs. 15 and 22. Segmental racks 112, one at each end, pivoted on the frame, mesh with these pinions and by their oscillation rotate the pinions intermittently in reverse directions. The fingers are so constructed and disposed that when moved from their initial positions (shown in Fig. 22) they are adapted severally to engage the pins 113 on the push-blocks opposite thereto, and as the fingers are swung around the ends of the line of the guides 3 3 they carry the push-blocks engaged thereby around from one straight line of push-blocks to the other straight line of push-blocks, and immediately thereafter by the reversal of the movement of the segmental racks 112 they are brought back to the initial positions. (Shown in Fig. 22.) These segmental racks 112 are severally connected medially by pitmen 114 114', Figs. 1, 2, 3, 4, 8, and 15, to crank-arms of rock-shafts 115 115', journaled in the frame. Each pitman is provided with a head 116 116', Figs. 1 and 4, into which the pitman turns and by means of which the pitman can be lengthened and shortened as desired, and each pitman is also provided with a terminal coupling member 117 117', to which the heads are hinged, and which coupling member is in turn pivoted on the crank of its rock-shaft 115 and 115'. The other cranks of these double-cranked rock-shafts 115 115' are connected by rods 118 118', Figs. 3 and 8, to crank-pins 119 119' on cog-wheels 120 120', which cog-wheels mesh with pinions 121 121' on the counter-shaft 66. The crank-pins 119 119' are adjustable radially in slots therefor on the cog-wheels, thereby providing for regulating the extent of the oscillation of the racks 112 to secure the proper movement of the fingers 110 110'.

When the machine is put in operation, warp-wires A A are led up through the guides 3 3 and over the roll 4, Figs. 1, 2, and 3, and are thence taken to and secured on the winding-up roll 5. The woof-wires on the spools 56 are carried up through the apertures in the heads 61 of the carriers 54 and are initially secured to the warp-wires with reference to anchoring the ends of the woof-wires preparatory to weaving the fence fabric. Thereupon, the machine being in the position shown in Fig. 1, so far as the push-blocks and the warp-wire guides and the woof-wire carriers are concerned, the machine is started and the woof-wire carriers and the warp-wire guides are rotated once and a half around by the rotation of the counter-shaft 66. This rotation of the woof-wire carriers once and a half around coils the woof-wires correspondingly about the central warp-wire just above the tops of the woof-wire carrier and the warp-wire guides, or where the warp-wire is absent coils about each other the two woof-wires that are being delivered from the woof-wire carriers in the same pairs of carriers opposite each other in the relations clearly shown in Fig. 1. This twist of the woof-wires about the warp-wire or about themselves may, if desired, be more than once and a half around—as, for instance, the twist may be two and a half or more times around. At the same time and by the revolution of the counter-shaft 66 the push-block at the right-hand extremity of the line L of push-blocks is carried around by the limited rotation of the finger 110, Fig. 22, to the other side of the line of guides 3 3

and into the line L' of the push-blocks. Thereupon by the reciprocal movement of the pawls 80 80' forwardly the push-blocks 76 will be advanced a distance equal to the distance between the vertical centers of the guides 3, the push-blocks in the line L moving toward the right and the push-blocks in the line L' moving toward the left, so that the woof-wire carriers (shown in pairs opposite each other in Fig. 1) will be moved away from each other in opposite directions to a location opposite the adjacent guides 3 3, which in Fig. 1 are shown as being unattended by any woof-wire carriers. At the time of this movement of the woof-wire carriers the warp-wires are advanced upwardly by the feed movement of the bar 6, which may be greater or less, as desired, the extent of which feed movement of the warp-wires upwardly will determine the angle of obliquity of the woof-wires B B from one warp-wire to the next warp-wire or to engagement with the adjacent woof-wire, as indicated in Figs. 31, 32, and 33—that is to say, the extent of the feed of the warp-wires will determine the angle of the woof-wires thereto, and consequently the angle of the sides of the diamond-shaped or triangular meshes of the fabric. Following this movement of the push-blocks and of the shifting of the woof-wire carriers the woof-wire carriers are again rotated with the warp-wire guides once and a half around, thus again coiling the woof-wires about the warp-wires or about each other, and at the same time the push-block at the extreme left in line L' will be carried around the end of the line of guides 3 to the line L of the push-blocks. It should be observed that the movement of the push-blocks ahead is in the same direction that the woof-wires are wound about the warp-wires, so that when the rotation of the woof-wire carriers about the warp-wires has wound the woof-wires thereon the forward movement of the carriers, advanced by the push-blocks in the same direction, will continue the tension on the woof-wires, and the coils formed thereby about the warp-wires or about each other of the woof-wires will not be slackened up or released by the subsequent movement of the woof-wire carriers, which is a movement continued in the direction of the coil. The fabric when completed is carried over the fabric-carrying roll 4, which is preferably provided with two or more bands 122 122, each having a number of radially-projecting spike-guides therein. In the drawings, Fig. 2, I have shown four of these bands. They are fitted snugly and yet adjustably lengthwise on the roll 4 and are advisably to be so arranged on the roll that the spikes will register alongside of warp-wires in the fabric on the inner side thereof. The bands 122 in Fig. 2 are shown as arranged for weaving two pieces of the fabric at the same time, one wider and one narrower, these spiked bands being so arranged as to be alongside the outer or marginal warp-wires of the two fabrics. I also preferably employ a guide-rod 123, mounted on the frame a little at the front of the roll 4 and below the horizontal plane of the axis of the roll 4. This guide-rod 123 is also provided with adjustable revolvable collars 124 124, having radial spikes therein, and this rod, with its spikes, is adapted to guide the fabric in its movement toward the roll 4 and to hold it to that roll. The spiked collars on the rod 123 are advisably located thereon to register with the spiked bands 122 on the roll 4. The fabric is carried from the roll 4 to the winding-up roll 5, on which it is wound in suitable form for transportation and for the market. The roll 5 is provided at each end with flattened tongues 125 125, Figs. 1, 9, 10, and 11, which fit removably in U-shaped sockets 126 126 on the ends of mandrels 127 127, journaled in the frame. Removable keys 128 128 secure the roll 5 detachably in the mandrels. This construction permits of the convenient lifting of the roll, with a quantity of fabric wound thereon, from its place on the mandrels and removing the roll from the coil of fabric, which is thereby left in a coiled or rolled-up condition. The roll 5 can then be readily replaced in the mandrels for winding other fabric thereon. The mandrel 127 at one end of the machine is provided with a ratchet-wheel 129, Figs. 1, 2, 8, and 9. A swinging arm 130, pivoted on the mandrel alongside the ratchet-wheel 129, is provided with a pawl 131, that engages the teeth of the wheel in one direction. The other extremity of the arm is connected by a device 132 to the free extremity of a swinging arm 133, pivoted on the frame. Cams 134 134 on the main shaft 33 are adapted to contact medially with the swinging arm 133 and push it laterally, causing the arm 130 to swing correspondingly and by means of the pawl 131 and ratchet-wheel 129 to rotate the roll 5 intermittingly. The connecting device 132 preferably consists of a head member 135, pivoted by a bolt to the arm 130, the bolt being adapted to be placed in any one of several apertures 136, located at unequal distances radially from the axis of the arm, two rods 137 137, with a cross-piece 138 on the two rods and secured adjustably thereto by nuts turning on threads on the rods, an overlapping rod 139, with its cross-head 140, through which the rods 137 pass movably, expansible springs 141 141, coiled about the rods 137 between the cross-piece and the cross-head, and a nut 142, turning on the rod 139 against the free extremity of the arm 133. The rod 139 passes movably through the cross-piece 136 and through the extremity of the arm 133. A stop 143, adjustable on the frame, by means of a bolt 144, through a slot in the base of the stop, is adapted to engage the swinging arm 133 and prevent its approach to the shaft 33 beyond a predetermined distance. This construction is adapted for regulating the throw of the swinging arm 130, and thereby is adapted for regulating the intermittent movement of the

roll 5, whereby the rotation of the roll is readily adapted for winding up the fabric thereon as fast as it is manufactured, both while the coil or fabric on the roll is small and after it has become large. A stop 145 prevents the throw of the arm 133 rearwardly beyond its normal movement. The stop is mounted adjustably on the frame. The springs 141 prevent any undue tension on the fabric. The adjustment that can be made of the head 135 on the arm 130 by means of its bolt and the apertures 136 also provides for the adjustment of the throw of the arm 130. A click 146, pivoted on the frame, is adapted to engage the rack-wheel 129 and prevent its rearward movement. Other clicks 147 147' are also advisably employed, which are hinged on the frame and are of such length and disposition as to be adapted to engage the teeth of the ratchet-wheel 129 at points in its movement between those at which it is engaged by the click 146. These additional or supernumerary clicks 147 147' are adapted to engage the teeth of the wheel 129 and prevent any backward movement of the wheel when the oscillation of the arm 130 is not sufficient to carry it a distance to be engaged by the click 146.

The main shaft 33 is provided with a clutch member 148, and a cog-wheel 149, loose on the shaft 33, is provided with a complementary clutch member and is adapted to be shifted on the shaft into engagement with the clutch member 148. The cog-wheel 149 meshes with an elongated pinion 150 on a pulley-shaft 151, journaled in the frame, and this pulley-shaft is provided with a pulley 152, adapted to be connected by a belt to any suitable source of power.

What I claim as my invention is—

1. In a wire-fence machine, the combination with a frame and a plurality of vertically-disposed warp-wire guides mounted thereon, of a vertically-movable warp-wire-feed bar located below the guides, and means for lifting the feed-bar and its load and permitting it to fall back to its initial position.

2. In a wire-fence machine, the combination with a frame provided with vertically-disposed ways thereon, of a warp-wire-feed bar mounted in the ways, means on the feed-bar for temporarily gripping the warp-wires thereto, and means for lifting the feed-bar and letting it fall back to its initial position.

3. In a wire-fence machine, the combination with a movable warp-wire-feed bar, of means for gripping a warp-wire thereto comprising a stud secured to the bar, a fixed grip-plate, a movable grip-block provided with a therete-hinged stem, toggle-joint members hinged together and one member hinged to the stud, a spring bearing on the stem of the grip-block and a member of the toggle-joint, and means for actuating the toggle-joint.

4. In a wire-fence machine, a warp-wire-gripping device comprising a stud fixed on a feed-bar, a grip-plate, a movable grip-block opposite the grip-plate, a stem pivoted to the grip-block and passing movably through a toggle-joint member, toggle-joint members hinged together and one member hinged to the stud, a spring bearing against a toggle-joint member and acting on the stem and grip-block, and a screw and nut interposed between the spring and the toggle-joint member whereby the tension of the spring may be regulated.

5. In a wire-fence machine, means for actuating a device for gripping warp-wires to a feed-bar comprising a toggle-joint connecting-rod 20, a bell-crank 22, a pitman connecting said rod to said bell-crank, a link 27 pivoted to the bell-crank and taking movably into ways in a slide, the slide reciprocable in ways therefor on the frame, and means for reciprocating the slide.

6. In a wire-fence machine, means for actuating a grip-operating slide reciprocably comprising the slide 28, an inner tappet 30 and an outer tappet 31 secured detachably on the slide, a shaft 33, and cams 32, 34 on the shaft adapted alternately to contact respectively with the tappets and reciprocate the slide.

7. In a wire-fence machine, the combination of a vertically-reciprocable warp-wire-feed bar, wire-gripping devices on the feed-bar, an oscillating lever 22 mounted on the feed-bar and connected operatively to the gripping devices and provided with a thereto-pivoted link having an elongated vertically-extending head, and a horizontally-reciprocable actuating-slide provided with a groove in which the head of said link reciprocates vertically and by which the link is [illegible] to horizontal movement with the slide.

8. In a wire-fence machine, the combination with a frame, and a warp-wire-feed bar reciprocable vertically in ways therefor on the frame, of means for intermittingly lifting the frame, comprising swinging tappets 30 supported at one extremity on the frame and projecting into the path of wipers, a shaft, said wipers loose on the shaft, cams fixed on the shaft, dogs on the wipers adapted to engage the cams and hold the wipers to revolution therewith, and means for disengaging the dogs from the cams.

9. In a wire-fence machine, a vertically-reciprocable warp-wire-feed bar, a tappet pivoted medially to the feed-bar, a hanger suspended pivotally from the frame and hinged to the outer extremity of the tappet, an idle wheel 41 on the tappet-feed-bar pivot-bolt adapted to travel on ways therefor on the frame in the direction of the movement of the feed-bar, and means for lifting the tappet.

10. In a wire-fence machine, a means for lifting a feed-bar tappet comprising a shaft, a wiper loose on the shaft, a dog pivoted on the wiper, a spring adapted to hold the dog normally yieldingly in the path of a cam, the

cam fixed on the shaft adapted to engage the dog, and a stop adapted to contact with the dog and disengage it from the cam.

11. In a wire-fence machine, a means for lifting a feed-bar tappet comprising a shaft, a wiper loose on the shaft, a dog provided with a beveled head pivoted on the wiper, a spring adapted to hold the dog normally yieldingly in the path of a cam, the cam fixed on the shaft adapted to engage the dog, and a stop adapted to contact with the beveled head of the dog and disengage it from the cam, said stop being mounted adjustably in the arc of the circle of rotation of the dog whereby the extent of the lift of the feed-bar may be regulated.

12. In a wire-fence machine, a rotatable warp-wire guide provided with a bore for the passage through it of a warp-wire axially, a pair of woof-wire carriers respectively on opposite sides of the warp-wire guide, means for rotating the warp-wire guide and synchronously revolving the woof-wire carriers about the axis of the warp-wire guide, and other means for controlling and shifting the woof-wire carriers from the woof-wire guide tangentially in reverse directions and always continuously of the general direction of the rotation of the carriers and guide.

13. In a wire-fence machine, a pair of revoluble woof-wire carriers located opposite each other, means for revolving the pair of wire-carriers, and means for shifting the carriers of a pair tangentially in opposite directions always in continuation of the movement of their revolutions.

14. In a wire-fence machine, the combination with a wire-carrier, of an arbor, a spool rotatable on the arbor, a band about the hub of the spool, means for clamping the band adjustably to the hub, and means to contact with and prevent the rotation of the band with the spool.

15. In a wire-fence machine, the combination of a series of warp-wire guides arranged in a straight line, woof-wire carriers in pairs respectively on opposite sides of each alternate one of said guides, means for shifting the carriers of each pair in reverse directions tangentially from opposite one guide to opposite the next adjacent guides always in the direction of the revolution of the carriers about their woof-wire guides, and means for revolving the carriers about the axis of the guides.

16. In a wire-fence machine, the combination of warp-wire guides disposed in a continuous line, woof-wire carriers in pairs respectively on opposite sides of each alternate guide, means for shifting the carriers of each pair in opposite directions from one guide to the adjacent guides, means for revolving the wire-carriers once and a half around the axis of their newly-acquired companion guide, and means for shifting the carriers back to their initially-adjacent guide but at the opposite sides thereof.

17. In a wire-fence machine, the combination of a series of woof-wire carriers disposed in pairs opposite each other, a series of interposed warp-wire guides, pinions below and axially of the guides and the carriers, grooves and complementary tongues on the carriers and the pinions respectively holding the carriers to revolution with the pinions but permitting them to slide into and out of engagement with the pinions, means for rotating the pinions, and other means for shifting the carriers from the pinions.

18. In a wire-fence machine, the combination of a series of woof-wire carriers arranged in pairs opposite each other, means for revolving the carriers of each pair about their common axis, push-blocks in two lines in which the carriers are severally mounted movably revolubly, and means for advancing the lines of push-blocks intermittingly in opposite directions.

19. In a wire-fence machine, the combination of a series of warp-wire guides arranged in a line, two series of woof-wire carriers arranged normally opposite to and abutting movably against warp-wire guides, means for revolving the carriers about the axis of the guides, two lines of push-blocks supported slidably on a bed and severally encircling a warp-wire carrier, and means for advancing the two lines of push-blocks and the carriers in opposite directions simultaneously.

20. In a wire-fence machine, the combination with a frame and a bed thereon, of push-blocks arranged in two lines, a push-block way on the bed extending in adjacent parallel straight lines and continuously around at the ends, a series of warp-wire guides in a line between the straight lines of the push-blocks, woof-wire carriers mounted in the push-blocks in the two lines at the two sides of the guides, means for advancing the two straight lines of push-blocks concurrently, and other means for advancing the push-blocks severally around at the ends of the straight lines of travel and from one straight line to the other straight line.

21. In a wire-fence machine, the combination with a frame and a bed thereon having an elongated push-block way, of push-blocks having woof-wire carriers mounted therein, the push-blocks being disposed and adapted to travel in adjacent parallel straight lines through a portion of their route, racks on the push-blocks, rock-shafts, pawls on the rock-shafts respectively engaging the racks on a line of the push-blocks, and means for oscillating the rock-shafts.

22. In a wire-fence machine, the combination with a frame and a bed thereon having an elongated push-block way, of push-blocks having woof-wire carriers mounted therein, the push-blocks being disposed and adapted to travel in adjacent parallel straight lines through a portion of their route, racks on the push-blocks, rock-shafts, pawls on the rock-shafts, pawl-blocks pivoted on the pawls en-

gaging a plurality of teeth on a push-block or push-blocks, and means for oscillating the rock-shafts concurrently.

23. In a wire-fence machine having two lines of push-blocks adapted to be advanced intermittingly in reverse directions, means for advancing the push-blocks step by step in two lines in opposite directions comprising an actuating cranked rock-shaft 91 at one end of the lines of push-blocks, an actuated cranked rock-shaft at the other end of the lines of push-blocks, pawls on the cranks of the rock-shaft engaging respectively the lines of push-blocks, a rod connecting the cranks of the two rock-shafts, and means for oscillating the actuating rock-shaft.

24. In a wire-fence machine, the combination with two lines of push-blocks adapted to be advanced intermittingly in reverse directions, of cranked rock-shafts one at each end of the lines of push-blocks, pawls on the cranks of the rock-shafts engaging respectively a line of the push-blocks, a rod connecting the cranks of said rock-shafts, said rod comprising principal members 92, 92', head members 94, 94' adjustable on the principal members, and an interposed swinging member 95 to which the head members are pivoted adjustably.

25. In a wire-fence machine, means for oscillating a rock-shaft adapted for advancing woof-wire carriers intermittingly, comprising a swinging lever 99, a rod connecting the swinging lever to a crank-arm on the rock-shaft, a rotatable shaft, a wiper 101 loose on the shaft, a cam fixed on the shaft, a dog on the wiper in the path of and adapted to be engaged by the cam, and a stop for releasing the dog from the cam.

26. In a wire-fence machine, the combination with a rock-shaft 91 provided with a crank-arm 97, of a swinging lever 99, a rod consisting of two members 98, 98' hinged together connecting the crank-arm to the lever, a shaft 33, a wiper 101 loose on the shaft, cams 45 fixed on the shaft, a dog with a beveled head pivoted on the wiper, a spring adapted to hold the dog normally yieldingly in the path of the cams, and a stop adapted to control the beveled head of the dog and push it out of engagement with the cams severally.

27. In a wire-fence machine, means for oscillating a rock-shaft 91 comprising a lever 99, a rod connecting the lever to a crank on the rock-shaft, a shaft 33, a wiper loose on the shaft, a cam fixed on the shaft, a dog on the wiper adapted to be caught by and released from the cam, and a second lever 107 in the path of the cam and connected operatively to the first-mentioned lever, whereby the rock-shaft is oscillated positively in both directions.

28. In a wire-fence machine, means for oscillating a rock-shaft 91, comprising a lever 99, a rod connecting the lever to a crank on the rock-shaft, a shaft 33, a wiper loose on the shaft, a cam fixed on the shaft, a dog on the wiper adapted to be caught by and released from the cam, a second lever 107 in the path of the cam and connected adjustably operatively to the first-mentioned lever, and a compensating spring 109 connected to a radial arm on the rock-shaft and to a fixed resistance.

29. In a wire-fence machine, means for revolving one or two woof-wire carriers comprising a pinion 63 provided with a transverse groove or grooves for receiving therein a tongue or tongues on the wire-carrier or wire-carriers, a double pinion 64' meshing with the grooved pinion, a beveled pinion meshing with the double pinion, a shaft on which the beveled pinion is fixed, and means for rotating the shaft intermittingly.

30. In a wire-fence machine, the combination with push-blocks carrying woof-wire carriers and adapted to travel in an elongated path on a bed, of pinions provided with fingers 110, 110' located respectively at the ends of the elongated path of the push-blocks, the fingers being adapted to catch onto the push-blocks and advance them severally in a semi-circular direction, segmental racks meshing with the pinions, and means for oscillating the segmental racks.

31. In a wire-fence machine, the combination with push-blocks carrying woof-wire carriers and adapted to travel in an elongated path on a bed, of pinions provided with fingers 110, 110' located respectively at the ends of the elongated path of the push-blocks, the fingers being adapted to catch onto the push-blocks and advance them severally in a semi-circular direction, segmental racks meshing with the pinions, doubly-cranked rock-shafts 113, 113' having crank connections to the segmental racks and to a cog-wheel, and a rotating shaft 66 provided with a pinion meshing with said cog-wheel.

32. In a wire-fence machine, a means for rotating woof-wire carriers intermittingly, comprising a counter-shaft 66 connected to the wire-carriers operatively by intermediate pinions, a pinion 69 on the counter-shaft, a main shaft, a mutilated cog-wheel on the main shaft provided with a flange projecting from its rim opposite the unmutilated portion of the rim, and a concave stop 71 fixed on the counter-shaft and adapted to bear against the rim-flange on the mutilated wheel and prevent rotation of the counter-shaft while opposite said flange.

33. In a wire-fence machine, a means for rotating a woof-wire carrier intermittingly, comprising a counter-shaft provided with a pinion, a main shaft, a mutilated cog-wheel on the main shaft with which the pinion meshes intermittingly, curved radial arms on the counter-shaft, and radial arms on the main shaft so disposed as to contact the arms on the countershaft as the teeth on the mutilated wheel come initially to the teeth on the pinion and insure the prompt rotation of the counter-shaft by the main shaft.

34. In a wire-fence machine, the combination with a counter-shaft provided with a pin-

ion and radial arms, of a main shaft, a mutilated wheel on the main shaft meshing intermittingly with the pinion, and curved radial arms on the main shaft formed in two members, the outer member being adjustable on the inner member radially and forwardly, whereby the arms on the main shaft can be disposed to contact earlier or later in each revolution with the arms on the counter-shaft.

35. In a wire-fence machine, a woof-wire-carrier support and advancing device, consisting of a push-block of substantially-rectangular form provided with a semicircular recess in one edge thereof, a semicircular flange about the recess adapted to fit around the base of a wire-carrier, a longitudinal flange 80 with underturned edge on the under side of the block, a pin 113 projecting from said flange, and a toothed rack on the upper surface of the block.

36. In a wire-fence machine, the combination with a frame provided with an elongated bed, of push-blocks adapted to travel in an endless path in straight parallel lines with connecting semicircular ends, means for advancing the push-blocks, semicircular flanges on the push-blocks, and guides 86 secured to the frame and provided with semicircular concave ends adapted to receive therein the flanges on the push-blocks and guide the push-blocks in a semicircular direction when being advanced.

37. In a wire-fence machine, the combination of a frame, a hollow pedestal 51 fixed on the frame, a warp-wire guide supported and revoluble on the pedestal, a pinion 63 mounted and revoluble on the pedestal, a woof-wire carrier supported above and engaging and rotatable with said pinion, and means for rotating the pinion.

38. In a wire-fence machine, the combination of a frame, a hollow pedestal 51 fixed on the frame, a warp-wire guide supported and revoluble on the pedestal, a pinion 63 mounted and revoluble on the pedestal, a woof-wire carrier supported above and engaging and rotatable with said pinion, a block-actuating pinion 111 mounted on the pedestal and about the hub of the first-enumerated pinion, and means for rotating the pinions.

39. In a wire-fence machine, a fabric-carrying device, comprising an idle roll provided with a plurality of bands adjustable along the roll longitudinally thereof, said bands each having a considerable number of radially-projecting spikes adapted to pierce the fabric adjacent to warp-wires and guide and hold the fabric to proper position in its forward movement.

40. In a wire-fence machine, fabric-guiding devices, combining a roll provided with bands adjustable thereon longitudinally, the bands each having a considerable number of fabric-piercing spikes, and a guide-rod a little in front of the roll, and revoluble collars adjustable on the rod, the collars having spikes therein adapted to pierce the fabric alongside the woof-wires and guide the fabric in its forward movement.

41. In a wire-fence machine, a fabric-coiling device, comprising a detachable roll provided with terminal tongues, mandrels with laterally-open sockets, means to secure the roll releasably in the sockets, a ratchet-wheel on one of the mandrels, a click engaging the ratchet-wheel and preventing the rearward rotation thereof, and means for rotating the roll intermittingly.

42. In a wire-fence machine, means for rotating a fabric-coiling roll, comprising a ratchet-wheel on the mandrel of the roll, a swinging lever provided with a pawl engaging the ratchet-wheel, a shaft, a cam on the shaft, a swinging arm in the path of the cam, and a rod connecting the lever to the swinging arm.

43. In a wire-fence machine, means for rotating a fabric-coiling roll, comprising a ratchet-wheel on the mandrel of the roll, a swinging lever provided with a pawl engaging the ratchet-wheel, a shaft, a cam on the shaft, a swinging arm in the path of the cam, means connecting the lever to the swinging arm including a head member 135 pivoted on the lever, parallel rods 137 provided with a cross-bar, a rod 139 movable through the cross-bar and provided with a cross-head through which the parallel rods pass movably, said rod telescoping with the parallel rods and being connected to the swinging arm, expansible springs about the parallel rods between the cross-head and the cross-bar, and stops limiting the swinging of the arm.

44. In a wire-fence machine, means for rotating a fabric-coiling roll, comprising a ratchet-wheel on the mandrel of the roll, a swinging lever provided with a pawl engaging the ratchet-wheel, a shaft, cams on the shaft, a swinging arm in the path of the cams, means connecting the lever to the swinging arm including a head member 135 pivoted and adjustable on the lever, parallel rods 137 provided with an adjustable cross-bar, a rod 139 movable through the cross-bar and provided with a cross-head through which the parallel rods pass movably, said rod telescoping with the parallel rods and being connected adjustably to the swinging arm, expansible springs about the parallel rods between the cross-head and the cross-bar, and stops limiting the swing of the arm.

In testimony whereof I affix my signature in presence of two witnesses.

MILES D TAYLOR.

Witnesses:
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157&158

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J. E. THORNTON.

PHOTOGRAPHIC FILM ROLL AND ROLL HOLDER.

(Application filed Mar. 20, 1900.)

(No Model.) 2 Sheets—Sheet 1.

WITNESSES.

Joseph Bates.

Alfred Barnes.

INVENTOR.

J. E. Thornton.

By Dowell Brown & Brown.

Atty.

159&160

No. 698,157. Patented Apr. 22, 1902.

J. E. THORNTON.

PHOTOGRAPHIC FILM ROLL AND ROLL HOLDER

(Application filed Nov. 20, 1900.)

(No Model.) 2 Sheets—Sheet 2.

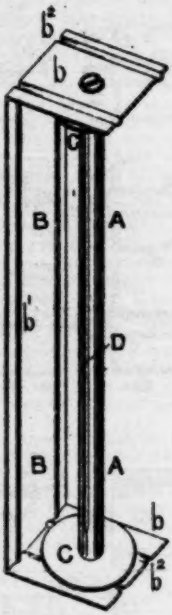


FIG. 4.

FIG. 14.

WITNESSES.

Joseph Bates.

Alfred Davies

INVENTOR.

J. E. Thornton

by A. W. Tamm O'Brien

Atty.

UNITED STATES PATENT OFFICE.

JOHN E. THORNTON, OF MANCHESTER, ENGLAND.

PHOTOGRAPHIC-FILM ROLL AND ROLL-HOLDER.

SPECIFICATION forming part of Letters Patent No. 698,157, dated April 22, 1902.

Application filed March 30, 1900. Serial No. 10,466. (No model.)

To all whom it may concern:

Be it known that I, JOHN EDWARD THORNTON, a British subject, residing at Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Photographic-Film Rolls and Roll-Holders, of which the following is a specification.

This invention is designed to provide a spool or reel for carrying the photographic films employed in cameras made from sheet metal in lieu of the wooden spool or reel hitherto used for the purpose.

I now make the spool or reel from sheet metal suitably shaped, either bent, spun, or jointed up.

The invention will be fully described with reference to the accompanying drawings.

Figure 1 is a side elevation, partly in section, of the spool or reel A and holder B, in which it rotates. Fig. 2 is an elevation from the back, showing the holder B; Fig. 3, an end elevation of Fig. 1. Fig. 4 is a perspective view of the same spool or reel A and holder B as in Fig. 1. Fig. 5 is a transverse section, enlarged, through the reel A. Fig. 6 is a side elevation, partly in section, of spool or reel A and holder B, showing a modification. Fig. 7 is an end elevation of Fig. 6. Fig. 8 is a side elevation, partly in section, showing another modification. Fig. 9 is an end elevation of Fig. 8. Fig. 10 is a longitudinal section on line X X, Fig. 9. Fig. 11 is a part side elevation, partly in section, showing another modification. Fig. 12 is a side elevation showing a further modification. Fig. 13 is a sectional plan of same on line Y Y, Fig. 12. Fig. 14 is a perspective view of the same spool or reel and holder as that shown in Fig. 12; Fig. 15, transverse section, enlarged, showing modified formation of the spool or reel.

The reel or spool A is preferably made, as shown in Fig. 5, from two pieces of sheet metal bent to D shape and attached together to make a cylindrical tube. The D-shaped pieces are bent with two flat inner sides, the edges or joints of the metal being placed at the outsides a a'. In order to form the slit or slot D the length of the spool through which to pass the end of the film, both ends at d are enlarged or otherwise the center part is indented, so that when the two parts are brought together the slit D is formed between them.

In the modification shown in Fig. 15 the spool A' is made from a single piece of sheet metal bent to the shape shown in Fig. 15, with the two edges a^2 a^3 turned into the interior and left sufficiently far apart to form the slot or slit D' between them. The slit D^2 at the opposite side is formed by a saw cut out which does not sever the ends d'.

The slot D or D' (shown in either of the Figs. 5 or 15) is constructed with internal walls d, which serve as guides for the film-paper passing through from side to side, so that the paper or film can be threaded through easily without meeting with any obstruction, as has been the case hitherto with tubular spools with a saw-cut at each side. The two inner walls also serve the purpose of engaging with a slotted key at one end, or with a tension device, friction-brake, or the like, or other mechanism that it may be desirable to connect therewith. The slotted key or other device is pushed onto the rib formed by the junction of the two walls, so that both will be rotated together.

The spool or reel A may be made with a flange C, as shown in Fig. 1, to prevent the penetration of light to the film when wound thereon, as shown in Fig. 1, or it may be made without such flange, the ends b of the holder B serving for the same purpose as in Figs. 6, 8, and 12.

The spool or reel A is mounted to rotate in a holder B, made of sheet metal, with ends b turned up at right angles to form the bearings for the spool or reel. The ends of the spool are passed through apertures made in the holder ends b, and these serve to hold together the two D-shaped pieces forming the spool-barrel. The ends of the spool may be expanded into the holes or apertures in the holder ends to retain them in position. The spool is preferably made a fairly tight fit in the apertures or bearings in the holder ends to bring sufficient friction to bear upon the rotating spool as to enable the ordinary friction-brake of the usual roll-holder to be dispensed with. The spool may, however, be permitted to rotate freely and a friction-brake be applied in the ordinary way.

The back of the metal holder is fluted or grooved with grooves b' to stiffen or strengthen it, and the ends are made with similar grooves b^2, which engage with projections in the roll-holder or camera-box and serve as guides to direct the holder into its proper place or position therein. The end grooves b' are placed in a different plane in the two ends to insure the holder always being fitted into the roll-holder or camera with the top end uppermost.

In Figs. 1, 2, 3, and 4 the spool A is shown with the flanges C.

In Figs. 6 and 7 the spool A is shown fitted into the holder B without flanges, the ends b of the holder serving the same purpose.

In Figs. 8, 9, and 10 the spool A is shown fitted into the holder B without flanges, the ends b being dished and the outer edges of the ends each being provided with a rim b^3 to strengthen or stiffen them.

In Fig. 11 a similar construction is shown to that described in Figs. 8 to 10, but without the rim or flange b^3.

It is to be understood that a flange similar to b^3 may be applied to either of the preceding forms of holder ends b.

In Figs. 12, 13, and 14 the holder B' for the spool is formed of the two longitudinal strips b^4 b^5, attached to the ends b^6.

What I claim as my invention, and desire to protect by Letters Patent, is—

1. A holder for photographic films comprising in its construction a reel of two D-shaped pieces of sheet metal, having the flat sides placed and secured together, in combination with a sheet-metal supporting-frame with ends provided with slots, into which the spool ends are fitted free to rotate therein, substantially as described.

2. A reel for photographic films comprising in its construction two D-shaped pieces of sheet metal with their flat sides placed face to face, and two end flanges by which they are secured together substantially as described.

3. In a holder for photographic films, the combination with a metallic frame or holder stamped from sheet metal, and provided with upturned ends of a sheet-metal reel provided with longitudinal slits and fitted into apertures in the ends of the holder, so as to rotate therein, substantially as described.

4. A photographic-film holder comprising in its construction, the holder B provided with stiffening-grooves, the upturned ends b provided with apertures and stiffening-grooves, and the spool A formed of two D-shaped pieces of sheet metal, the ends d of which are fitted into the aperture in the holder ends b and provided with longitudinal slits D' between the two parts, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

J. E. THORNTON.

Witnesses:
J. OWDEN O'BRIEN,
HARRY BARNFATHER.

No. 758,322. PATENTED APR. 26, 1904.

C. KRAUSE.

MACHINE FOR REROLLING CLOTH.

APPLICATION FILED NOV. 10, 1903.

NO MODEL.

Fig. 1.

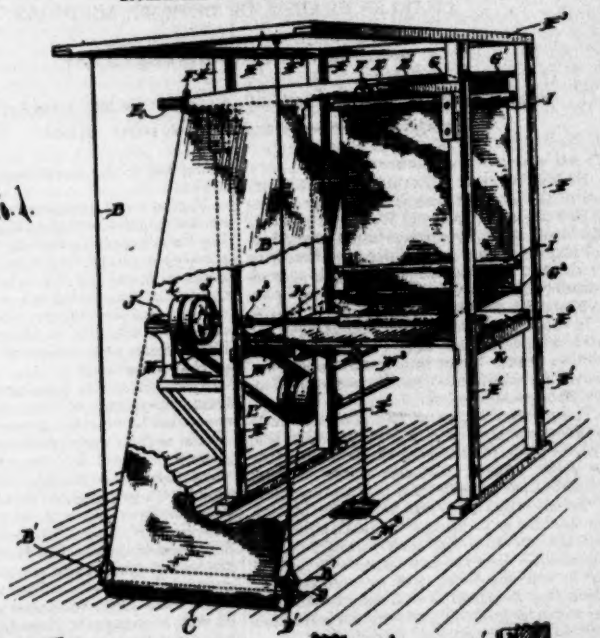


Fig. 2.

Fig. 4.

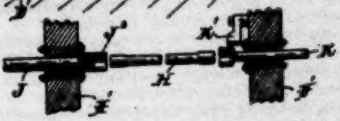
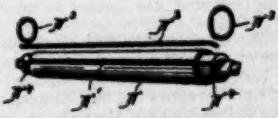


Fig. 3.

Fig. 5.



WITNESSES.

Louis C. Fraser

Chas. Bartlett

INVENTOR.

Charles Krause

By Bartlett & Bartlett

Attorneys.

No. 758,822. Patented April 26, 1904.

UNITED STATES PATENT OFFICE.

CHARLES KRAUSE, OF DETROIT, MICHIGAN.

MACHINE FOR REROLLING CLOTH.

SPECIFICATION forming part of Letters Patent No. 758,822, dated April 26, 1904.

Application filed November 19, 1903. Serial No. 181,818. (No model.)

To all whom it may concern:

Be it known that I, CHARLES KRAUSE, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Machines for Rerolling Cloth, &c., of which the following is a specification, reference being had therein to the accompanying drawings.

In the manufacture of certain fabrics the cloth is made up into large rolls, and this invention relates to an improved machine for rewinding these rolls for the purpose of inspection, measuring, &c.

The primary object of the invention is to provide a machine which will rewind the fabric with despatch and accuracy without wrinkling the goods, making the ends of the rewound roll as even as possible; and it is also an object of the invention to so lead the fabric through the machine as to bring it into such a position that the operator may look through it, and thus readily discover any imperfections, and also to wind the fabric with an even tension, which may be adjusted according to the kind and width to make a tightly-wound roll which will not be easily crushed in shipping.

To this end the invention consists in so supporting the roll of fabric to be rewound that it puts an even strain upon the cloth as it is wound therefrom, said roll being free to move longitudinally upon its support or laterally, one end at a time, to equalize the strain when one edge of the cloth is fuller than the other or has been stretched tighter in winding the original roll.

It also consists in leading the cloth over a series of rolls and bars supported by a suitable frame in such a manner that there will be a vertical stretch of the fabric interposed between the operator and the light, the rolls and bars also serving to create a frictional resistance to the winding, and thus the tightness with which the cloth will be wound may be regulated by changing the lead to run the cloth over different combinations of rolls and bars; and the invention further consists in providing certain other new and useful features, all as hereinafter more fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of a device embodying the invention; Fig. 2, a detail showing the adjustable guide-studs; Fig. 3, a detail showing a perspective view of one end of the supporting-bar for the original roll and the manner of supporting said bar; Fig. 4, a sectional detail showing the rewinding-shaft and manner in which it is held and driven, and Fig. 5 a perspective view of a modified form of rewinding-shaft.

As shown in the drawings, A is a suitable frame consisting of four upright posts A′, connected by suitable cross-bars and a table A^2 and at their upper ends by forwardly-projecting side bars A^3, connected at their forward ends by the bar A^4. This bar A^4 is provided with two eyes for the attachment of two ropes B, provided with two common round iron rings B′, secured to their lower ends and hanging adjacent to the floor. C represents the roll of fabric to be rewound, which roll is supported upon a round bar or shaft D, provided with circumferential grooves D′ near its ends to engage the rings B′. The bar after being put through the roll is laid with its ends projecting through the rings and the grooves engaging the same, the roll being thus free to turn upon the rings and suspended from the bar A^4, or it may be supported from the ceiling, if desired.

Secured to the front posts A′ of the frame and near their upper ends are the brackets E′, which project forwardly from the frame, but not as far as the bars A^3, and the ends of these brackets are connected by a supporting-bar E, over which the cloth is led from the roll C, the forward edge of said bar being rounded to engage the cloth. To prevent the cloth from moving longitudinally of the bar and to form guides therefor, studs F, preferably of porcelain or similar material, are adjustably secured to the bar by providing the bar with longitudinal slots E^2 to receive the bolts F′, which pass through the studs and slots and are secured therein by winged nuts on their lower ends. From the supporting cross-bar E the cloth passes over a supporting-rod G,

which extends across between the forward posts A' of the frame, thence over a similar rod G' on the rear posts, downward and around a like rod G², which extends across the frame between the rear posts at a short distance above the table A', and thence forward above said table to the winding-shaft H. Mounted to turn freely upon bearings on the rear posts A' and extending across between the same are the rolls I and I', the roll I extending parallel with and adjacent to the lower side of the rod G' and the roll I' adjacent to the upper side of the rod G².

When it is found that too much strain is being put upon the fabric by the friction of passing over the stationary rods, and thus the cloth caused to wrinkle as it is wound upon the shaft H, it may be led around one of the rolls and one of the bars or both of the rolls and neither of the bars, thus reducing the friction and consequent strain sufficiently to prevent wrinkling and cause the cloth to wind smoothly and not too tightly.

The winding-shaft H is driven by a short driving-shaft J, provided with a tight and a loose pulley and mounted in a bearing J' on the frame and a bearing in the adjacent post A', said driving-shaft being provided at its inner end with a squared socket J² to receive the squared end of the shaft or bar H, the opposite end of said shaft H, which is also squared, being engaged by a squared socket on the end of a short longitudinally-movable shaft K, mounted in a bearing in the opposite post A' at the front of the frame. One squared end of the shaft H is inserted in the socket J² and then the shaft K moved longitudinally to engage its socket with the opposite squared end, in which position the shaft K is held to hold the winding-shaft in place by a pawl K', which drops behind a shoulder on the shaft K and holds the same from moving out of engagement with the winding-shaft.

The driving-shaft J is driven in any suitable manner, as by the belt L, which is normally held in engagement with the loose pulley on said shaft by a shifting-bar M, longitudinally movable in bearings on the frame. A coil-spring M' on said bar exerts a force to hold the same shifted to a position to hold the belt in engagement with the loose pulley and is moved against the action of said spring to shift the belt to the tight pulley and drive the winding-shaft by a cable M², secured to the end of said bar and passing over a pulley on the frame to a treadle M³ on the floor beneath.

In winding certain kinds of fabrics it is found necessary to provide means for securing the inner end of the cloth to the winding-shaft in starting, and in Fig. 5 a shaft provided with such means is shown. The shaft N is provided with a longitudinal groove N' to receive a binding-bar N², which is held in place within said groove to clamp the cloth therein by rings N³, fitting over the reduced ends N⁴ of the shaft.

The roll of fabric to be rewound being suspended as described, when one edge of the fabric is tighter than the other the end of the roll at that side of the fabric which is tightest will swing inward, thus compensating for such difference and giving an even strain on the fabric, and by providing the combination of rolls and rods the tension under which the fabric is fed to the winding-shaft is easily regulated for various widths of goods.

Having thus fully described my invention, what I claim is—

1. In a rewinding-machine, the combination with a winding-shaft and means for actuating the same, of a bar for supporting the roll to be rewound, and means whereby the bar is supported and permitted to move horizontally in any direction.

2. In a rewinding-machine, the combination with a winding-shaft and means for actuating the same, of a bar for supporting the roll to be rewound, and means engaging said bar to suspend the same and allow it to freely swing.

3. In a rewinding-machine, the combination with a winding-shaft and means for actuating said shaft, means for supporting and guiding the strip of material to be wound, a bar for supporting the roll of material to be rewound, and vertically-extending flexible means for supporting said bar attached to the ends thereof and secured to a suitable support at a distance above the roll.

4. In a rewinding-machine, the combination with a winding-shaft and means for actuating said shaft, of a bar for supporting the roll to be rewound and a flexible support to engage and support each end of said bar.

5. In a rewinding-machine, the combination with a winding-shaft and means for actuating said shaft, of means over which the strip of material to be wound is led to put a strain thereon, a bar for supporting the roll to be rewound, and ropes secured at their upper ends to a suitable support and at their lower ends, attached to the ends of said bar to suspend the same.

6. In a rewinding-machine, the combination with the frame, ropes secured to a support forward of the frame and near the upper end thereof, rings on the lower ends of said ropes, a bar for supporting the roll to be rewound adapted to engage said rings at its ends, means on the frame over which the strip from the roll is led to put a frictional strain thereon, a winding-shaft mounted in bearings on the frame, and means for actuating said shaft.

7. In a rewinding-machine, the combination with a frame thereof, of means for suspending the roll to be rewound at the forward side of the frame and free to swing, a supporting cross-bar on the frame near the upper end

thereof provided with slots, studs having bolts extending through said slots and provided with nuts to engage the bar, rods extending across the frame at the rear side thereof over which the strip may be led vertically, rolls journaled in bearings on the frame adjacent to said rods, a driving-shaft provided with a socket mounted in bearings at the forward side of the frame, a tight and a loose pulley on said shaft, a longitudinally-movable shaft having a socket, a winding-shaft having squared ends to engage said sockets, means for preventing the longitudinally-movable shaft from moving longitudinally, a shifting-bar for shifting the belt on said pulleys, a spring for actuating said bar in one direction, and a treadle for actuating the same in the opposite direction.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES KRAUSE.

Witnesses:
OTTO F. BARTHEL,
OLIVER E. BARTHEL.

Certificate of Clerk.

UNITED STATES OF AMERICA,
Northern District of Illinois,
Eastern Division, ss:

I, John H. R. Jamar, Clerk of the District Court of the United States for the Northern District of Illinois, do hereby certify that I herewith transmit to the United States Circuit Court of Appeals for the Seventh Circuit, certain original exhibits in the case entitled Duplicator Manufacturing Company, Plaintiff, vs. Theodore A. Heyer, doing business under the name of T. A. Heyer Duplicator Company, Defendant, In Equity, No. 956, said exhibits are marked as follows, to-wit:

Plaintiff's Exhibits, as Follows:

Exhibit No. 1—Copy of the patent in suit.

Exhibit No. 2—Assignment of Title to Plaintiff.

Defendant's Exhibit No. 2, comprising copies of the *the* following patents:

No. 237,158, February 1, 1881, Bendall,
373,800, November 22, 1887, Dooley,
485,275 November 1, 1892, Hanson,
577,369 February 16, 1897, McIntire,
646,112, March 27, 1900, Taylor,
698,157, April 22, 1902, Thornton,
758,322 April 26, 1904, Krause.

Also the following physical exhibits:

Plaintiff's Exhibits:

No. 3, Plaintiff's Commercial Duplicator,

No. 10, Plaintiff's Instruction Book.

Defendant's Exhibit:

No. 1, Spindles produced by Defendant's witness—Theodore A. Heyer.

In Testimony Whereof, I have hereunto set my hand and affixed the seal of said Court at my office in the City of Chicago, this 8th day of August. John H. R. Jamar, Clerk.

At a regular term of the United States Circuit Court of Appeals for the Seventh Circuit, begun and held in the United States Court Room, in the city of Chicago, in said Seventh Circuit, on the fifth day of October, 1920, of the October term in the year of our Lord one thousand nine hundred and twenty and of our Independence the one hundred and forty-fifth.

And afterwards, to-wit: On the seventeenth day of August, 1921, in the October term aforesaid, came the appellant, by its counsel, Mr. George L. Wilkinson and Mr. Samuel N. Pond, and filed in the office of the clerk of this court their appearance, which said appearance is in the words and figures following, to-wit:

United States Circuit Court of Appeals for the Seventh Circuit, October Term, 1920.

No. 3030.

[Title omitted.]

Appearance.

[Filed Aug. 17, 1921.]

The clerk will enter my appearance as counsel for the plaintiff-appellant. Geo. L. Wilkinson, First Nat. Bank Bldg., Ch'go. Samuel N. Pond, 1232 Monadnock Bldg., Ch'go.

[File endorsement omitted.]

And afterwards, to-wit: On the twenty-fourth day of August, 1921, in the October term aforesaid, came the appellee, by his counsel, Mr. Samuel W. Banning, and filed in the office of the clerk of this court his appearance, which appearance is in the words and figures following, to-wit:

United States Circuit Court of Appeals for the Seventh Circuit, October Term, 1920.

No. 3030.

[Title omitted.]

Appearance.

[Filed Aug. 24, 1921.]

The clerk will enter my appearance as counsel for the Appellee. Samuel W. Banning, 1632 Marquette Bldg., Chicago.

[File endorsement omitted.]

At a regular term of the United States Circuit Court of Appeals for the Seventh Circuit, begun and held in the United States Court Room in the City of Chicago, in said Seventh Circuit, on the fourth day of October, 1921, of the October term in the year of our Lord one thousand nine hundred and twenty-one and of our Independence the one hundred and forty-sixth.

And afterwards, to-wit: On the third day of January, 1922, in the October term last aforesaid, the following further proceedings were had and entered of record, to-wit:

Tuesday, January 3, 1922.

Court met pursuant to adjournment and was opened by proclamation of crier.

Present: Hon. Francis E. Baker, Circuit Judge, presiding; Hon. Samuel Alschuler, Circuit Judge; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge; Hon. Claude Z. Luse, District Judge; Edward M. Holloway, Clerk; Robert R. Levy, Marshal.

Before Hon. Francis E. Baker, Circuit Judge; Hon. Samuel Alschuler, Circuit Judge; Hon. Evan A. Evans, Circuit Judge.

[Title omitted.]

Order Setting Cause for Hearing.

It is now here ordered that this cause be, and the same is hereby set down for hearing Friday, January 27, 1922.

And afterwards, to-wit: On the twenty-seventh day of January, 1922, in the October term last aforesaid, the following further proceedings were had and entered of record, to-wit:

Friday, January 27, 1922.

Court met pursuant to adjournment and was opened by proclamation of crier.

Present: Hon. Francis E. Baker, Circuit Judge, presiding; Hon. Samuel Alschuler, Circuit Judge; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge; Edward M. Holloway, Clerk; Robert R. Levy, Marshal.

Before: Hon. Samuel Alschuler, Circuit Judge; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge

[Title omitted.]

Argument and Submission.

Now this day come the parties by their counsel and this cause now comes on to be heard on the printed record and briefs of counsel and on oral arguments by Mr. George L. Wilkinson, counsel for appellant, and by Mr. Samuel W. Banning, counsel for appellee, and the court having heard the same takes this matter under advisement.

And afterwards, to-wit: On the twelfth day of May, 1922, in the October term last aforesaid, there was filed in the office of the clerk of this court the Opinion of the court, which said Opinion is in the words and figures following, to-wit:

In the United States Circuit Court of Appeals for the Seventh Circuit, October Term, 1921, April Session, 1922.

No. 3030.

[Title omitted.]

Before Alschuler, Evans, and Page, Circuit Judges.

Opinion.

EVANS, *C. J.*: Appellant charged infringement of United States letters patent No. 965,887 to Flanigan for a multiple copying machine. In the district court the bill was dismissed for want of equity. On the 42 claims of the patent, infringement is alleged of but one, which is:

"42. In a multiple copying machine, the combination with a machine frame having on one side thereof a journal bearing and on the opposite side a chuck, of a duplicating band, and a spool on which said duplicating band is wound, said spool having at each end a squared chuck-engaging member and cylindrical bearing member, whereby said spool is interchangeable end for end between said chuck and journal bearing, substantially as described."

The infringement charged is in the making and selling, prior to the filing of the bill, of spools and of duplicating bands wound thereon, for use on the patented machine. The bands are made of a gelatinous substance well known in the hectograph and copying machine art. A master copy of the desired instrument is made by typewriter or otherwise, with a peculiarly adapted ink, and the master copy being placed face down on the surface of the duplicating band, the ink is transferred from the copy to the band, and from this there may be printed any desired number of copies up to about 100. After from 18 to 24 hours the ink is absorbed from the surface toward the opposite side of the band, and the same surface is ready to be used again in the same way. This particular surface may thus be used from 30 to 50 times, depending upon the number of copies made. With each copy made there is withdrawn from the surface a certain amount of the substance, so that after using 30 to 50 times with the full number of copies, or a greater number of times where less copies are made, that particular part of the surface is worn out. The bands may be of desired length, in plaintiff's machine usually about 14 feet, and they are initially wound upon one of the spools and, as used, rolled up on another spool, and a fresh surface presented without waiting for the first surface to become usable again. The rolling of the band as used greatly facilitates the work where much copying is to be done. The spools are so constructed that when the entire roll has passed from one spool to the other and sufficient time has elapsed so that the last of the surface is again usable, the spool upon which it is wound may be placed in the same position as was the first spool without the need of first winding it onto another spool,

This results from the interchangeability of the spools through each end's having a square chuck-engaging member and a cylindrical bearing member.

The alleged infringing acts are admitted, but it is contended that the supplying of the spools and the bands for the machine is not an infringement, appellee maintaining that the purchasers of the machine and licensees under the patent have the right to supply and restore these parts as necessary and proper in the intended use of the machine. Failing in this contention, he urges his right to use the gelatinous band, if not the spool.

Appellant sells the machine outright without undertaking to impose contractual obligations or limitations. It contends that these parts each constitute an element of the combination claim in question, and may not be replaced or supplied by the licensee, or by others for use on its machines, except with appellant's consent; and further that these are not repairs of such a kind as under the law the licensee may himself replace, but are parts of a combination for which it has a monopoly.

The question for determination may be presented thus: Does A avoid infringement of a patent to B when, knowing of its intended use, he supplies to C, a user, one or even two elements in the patented combination, because of the fact that such element or elements are of such short life as the recited facts show the spool and band covered by the patent in suit to be? In other words, was the replacement of the spool or band repair or reconstruction? Of the spools there can be no doubt.

What constitutes reconstruction, what repair? Does reconstruction depend upon the lasting and durable qualities of an element? Or presented differently, is the passing or temporary character of an element decisive of the question of repair? Upon the authority of Leeds & Catlin v. Victor Talking Machine Co., 213 U. S. 325, these questions must be answered in favor of appellant.

The following quoted language, the crux of the decision, is determinative:

"What rights does he (the purchaser) derive from it? * * * Has he a license to repair deterioration, and when does repair become reconstruction? It would seem that on principle when deterioration of an element has reached the point of unfitness there is a destruction of the combination and a renewal of the element is a reconstruction of the combination. And it would also seem on principle that there could be no license implied from difference in the durability of the elements or periodicity in their use."

Appellee relies upon Morgan Envelope Co. v. Albany Paper Co., 152 U. S. 425. The opinion is carefully considered and distinguished in the Victor Talking Machine case. Speaking of the Morgan Envelope case, the court said in the Victor Talking Machine opinion (p. 335):

"The court, however, stated, that there were cases to the effect that the scale of one element of a combination with intention that it

should be used with another was an infringement, but decided that they had no application to one where the element made by the alleged infringer was 'an article of manufacture, perishable in its nature, which it is the object of the mechanism to deliver, and must be renewed periodically whenever the device is put to use.' The case therefore, is not a precedent for the decision of that at bar. Not one of the determining factors there stated exists in the case at bar. If the operative relation of the paper roll to the mechanism was as illustrated (and the court left no doubt that it was), that is, of the log to the saw in the mill, wheat to the rollers which grind it, pins which are produced by a patent machine; in other words, in no more operative relation than a machine and its product are, the invalidity of the combination was hardly questionable. And, besides, it was made a determining circumstance that the paper perished by its use, and a periodical renewal was indicated to be a renewal 'whenever the device was put to use.' "

With the wisdom of the legislation which protects a monopoly in a combination, one element of which calls for frequent renewal, we are not concerned. We are dealing with the legislative enactment, the statute in force, which defines the extent of patentee's grant.

So viewing the question in the light of these decisions, we conclude appellee was infringing the patent in suit under the circumstances here disclosed.

The decree is reversed with costs and with directions to the District Court to enter a decree in favor of appellant and for an accounting.

Separate Opinion.

ALSCHULER, *Cir, J.*, disagreeing in part:

To my mind the gelatinous duplicating bands should be considered an incident or supply, necessary from time to time to be provided in the contemplated use of this permanent machine, which appellant at its price had sold appellee. It is undisputed that such gelatinous bands are old, and were long in use on other machines of this general kind, and long procurable in the open market, of such dimensions as the purchaser might desire. If used to full capacity the band lasts about thirty days, and must then be replaced by a new one.

They are comparable to the carbon paper and inked ribbons of typewriting machines. It would scarcely be contended that on sale of an improved typewriter by a patentee thereof, the vendor would retain a monopoly during the patent term for supplying on his terms the ordinary carbon paper and ribbons necessary to make use of it. It should make no difference, if, as in the case before us, the patentee had succeeded in securing claims (in the parlance of patents), for a combination, in a typewriting machine, of a metallic frame, typebars, type, typewriter-ribbon, ink, carbon paper, means for actuating the movement of such ribbon and carbon paper, etc., etc., etc. The inclusion of the ribbon and carbon paper as elements of the com-

bination would make them none the less ordinary supplies for using the machine.

I do not think that the Victor Talking Machine decision, 213, U. S. 325, whereon is rested the majority opinion herein, has application to the facts here appearing. The element there in issue (the disc) of the combination was not a supply, soon consumed in the intended use of the machine. It was pointed out that the element of the disc is not in the proper sense perishable, but with normal use may be expected to last indefinitely; and it was stated that the supplying of new discs does not fall within the category of replacement or resupply or substitution of worn-out parts. The opinion further states that "the disc is not a mere concomitant to the stylus; it co-acts with the stylus to produce the result. Indeed, as we have seen, it is the distinction of the invention, constituting, by its laterally undulating line of even depth and the effect thereof, the advance upon the prior art." Not so the duplicating band, an ordinary consumable supply, "the same yesterday, today" and in no wise distinctive.

Appellant, having obtained its price on its absolute sale of the machine, should not be further accorded the monopoly of supplying these bands. To hold otherwise contravenes the spirit of the decisions in Straus v. Victor Talking Machine Co., 243 U. S. 490; Motion Picture Co. v. Universal Film Co., 243 U. S. 502; Boston Store v. Am. Graphophone Co., 246 U. S. 8; United Shoe Machinery Corp. et al. v. United States, — U. S. — (Apr. 17, 1922).

In my judgment the decree should be sustained as to the gelatinous bands.

A true Copy. Teste: —— ——, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

And afterwards, on the same day, to-wit: On the twelfth day of May, 1922, in the October term last aforesaid, the following further proceedings were had and entered of record, to-wit:

Friday, May 12, 1922.

Court met pursuant to adjournment and was opened by proclamation of crier.

Present: Hon. Francis E. Baker, Circuit Judge, presiding; Hon. Samuel Alschuler, Circuit Judge; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge; Edward M. Holloway, Clerk; Robert R. Levy, Marshal.

Before Hon. Samuel Alschuler, Circuit Judge; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge.

[Title omitted.]

Decree.

This cause came on to be heard on the transcript of the record from the District Court of the United States for the Northern District of Illinois, Eastern Division, and was argued by counsel.

On consideration whereof, It is now here ordered, adjudged and decreed by this court that the decree of the said District Court in this cause be, and the same is hereby reversed with costs; and that this cause be, and the same is hereby remanded to the said District Court with directions to enter a decree in favor of appellant and for an accounting.

And afterwards, to-wit: On the sixth day of June, 1922, in the October term last aforesaid, there was filed in the office of the clerk of this court a certain Petition for a Rehearing, which said Petition for a Rehearing is not copied here nor made a part of this record.

And afterwards, to-wit: On the ninth day of June, 1922, in the October term last aforesaid, the following further proceedings were had and entered of record, to-wit:

Friday, June 9, 1922.

Court met pursuant to adjournment.

Present: Hon. Samuel Alschuler, Circuit Judge, presiding; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge; Edward M. Holloway, Clerk.

[Title omitted.]

Order Denying Petition for Rehearing.

It is ordered by the court that the petition for a rehearing in this cause be, and the same is hereby denied.

And afterwards, to-wit: On the tenth day of June, 1922, in the October term last aforesaid, the following further proceedings were had and entered of record, to-wit:

Saturday, June 10, 1922.

Court met pursuant to adjournment.

Present: Hon. Samuel Alschuler, Circuit Judge, presiding; Hon. Evan A. Evans, Circuit Judge; Hon. George T. Page, Circuit Judge; Edward M. Holloway, Clerk.

Order Staying Mandate.

Before Hon. Evan A. Evans, Circuit Judge.

[Title omitted.]

On motion of counsel for appellee, it is ordered that the mandate in this cause be, and the same is hereby stayed until the further order of this court.

Clerk's Certificate.

United States Circuit Court of Appeals for the Seventh Circuit.

I, Edward M. Holloway, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit, do here y certify that the foregoing pages, numbered from 1 to 12, inclusive, contain a true copy of the proceedings had and papers filed (except the briefs of counsel and the petition for a rehearing) in the following entitled cause: Duplicator Manufacturing Company vs. Theodore A. Heyer, Doing business under the name of T. A. Heyer Duplicator Company, No. 3030, October Term, 1920, as the same remains upon the files and records of the United States Circuit Court of Appeals, for the Seventh Circuit.

In testimony whereof I hereunto subscribe my name and affix the seal of said United States Circuit Court of Appeals for the Seventh Circuit, at the City of Chicago, this twenty-third day of June, A. D. 1922. Edward M. Holloway, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit, by Frederick G. Campbell, Deputy Clerk. [Seal of the United States Circuit Court of Appeals, Seventh Circuit.]

[File endorsement omitted.]

Clerk's Certificate.

United States Circuit Court of Appeals for the Seventh Circuit.

I, Edward M. Holloway, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit, do hereby certify that the foregoing pages, numbered from 1 to 169, inclusive, contain a true copy of the printed record, printed under my supervision and filed on the twenty-fourth day of Sepember, 1921, on which the following entitled cause was heard and determined: Duplicator Manufacturing Company vs. Theodore A. Heyer, Doing Business as T. A. Heyer Duplicator Company, No. 3030, October Term, 1920, as the same remains upon the files and records of the United States Circuit Court of Appeals, for the Seventh Circuit.

In testimony whereof I hereunto subscribe my name and affix the seal of said United States Circuit Court of Appeals for the Seventh Circuit, at the City of Chicago, this twenty-third day of June, A. D. 1922. Edward M. Holloway, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit, by Frederick G. Campbell, Deputy Clerk. [Seal of the United States Circuit Court of Appeals, Seventh Circuit.]

Writ of Certiorari and Return.

[Filed Nov. 10, 1922.]

UNITED STATES OF AMERICA, *ss:*

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the Honorable the Judges of the United States Circuit Court of Appeals for the Seventh Circuit, Greeting:

Being informed that there is now pending before you a suit in which Duplicator Manufacturing Company is appellant, and Theodore A. Heyer, doing business as T. A. Heyer Duplicator Company, is appellee, No. 3030, which suit was removed into the said Circuit Court of Appeals by virtue of an appeal from the District Court of the United States for the Northern District of Illinois, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said Circuit Court of Appeals and removed into the Supreme Court of the United States, do hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable William H. Taft, Chief Justice of the United States, the twenty-sixth day of October, in the year of our Lord one thousand nine hundred and twenty-two. Wm. R. Stansbury, Clerk of the Supreme Court of the United States.

In the United States Circuit Court of Appeals for the Seventh Circuit, October Term, A. D. 1920.

No. 3330.

DUPLICATOR MANUFACTURING COMPANY, Appellant,
vs.
THEODORE A. HEYER, Doing Business as T. A. Heyer Duplicator Company, Appellee.

Stipulation.

It is hereby stipulated by and between counsel that the printed record heretofore filed in the Supreme Court of the United States as an exhibit to appellee's petition for writ of certiorari, together with the exhibits now in the possession of the Clerk of the Court of Appeals, and not included in the printed record, may be taken as a return for the writ of the Supreme Court dated October 26, 1922.

It is further stipulated that any additional exhibits, not now in the possession of the Clerk, may remain in the possession of the party offering the same to be produced at the time of hearing in

the Supreme Court. Chicago, Illinois, October 31, 1922. Geo. L. Wilkinson, Counsel for Appellant. Samuel W. Banning, Counsel for Appellee.

Endorsed: Filed Nov. 7, 1922. Edward M. Holloway, Clerk.

UNITED STATES OF AMERICA,
Seventh Circuit, ss:

In obedience to the command of the foregoing writ of certiorari and in pursuance of the stipulation of the parties, a full copy of which is hereto attached, I do hereby certify and return that the transcript of the record filed with the application to the Supreme Court of the United States for a writ of certiorari in the case of Duplicator Manufacturing Company, appellant, vs. Theodore A. Heyer, doing business as T. A. Heyer Duplicator Company, appellee, is a full, true and complete transcript of the record upon which said cause was heard in the United States Circuit Court of Appeals for the Seventh Circuit, together with all proceedings in said court.

In testimony whereof, I hereunto subscribe my name and affix the seal of said United States Circuit Court of Appeals for the Seventh Circuit, at the City of Chicago, this seventh day of November, A. D. 1922. Edward M. Holloway, Clerk of the United States Circuit Court of Appeals for the Seventh Circuit. [Seal of the United States Circuit Court of Appeals, Seventh Circuit.]

[File endorsement omitted.]